STRUCTURAL ANALYSIS OF EQUIPMENT STATION 75-0010 VOLUME I

November 1977

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INFORMATION AND ANALYSIS CENTER

OPERATED FOR THE AIRFORCE FLIGHT DYNAMICS LABORATORY
BY ANAMET LABORATORIES, INC.

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This report describes the structural analysis used to verify the structural adequacy of equipment station 75-0010 under crash loadings as specified by MIL-A-8865. This work was done by the Aerospace Structures Information and Analysis Center, which is operated for the Air Force Flight Dynamics Laboratory by Anamet Laboratories under Contract Number F33615-77-C-3046. The work was performed in support of the 6585th Test Group at Holloman Air Force Base, New Mexico.

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MICROFICHE COPIES OF NASTRAN STRUCTURAL ANALYSIS RUNS CAN BE FOUND ON INSIDE BACK COVER OF VOLUME I.

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LIST OF ILLUSTRATIONS

I. INTRODUCTION

This report documents a structural analysis performed by ASIAC at the request of the Air Force to verify the structural adequacy of equipment station 75-0010 under crash loadings as specified by MIL-A-8865.

Equipment station 75-0010 is schematically shown in Fig. 1. The equipment station is composed of a rack pallet and a seat pallet. A typical rack pallet with isolators used for connecting the rack to the pallet is shown in Fig. 2. Shown in Fig. 3 is a picture of a typical rack structure. Detailed finite element models of the equipment rack and pallets have been developed in order to accurately determine deflections and stresses at equipment station 75-0010.

Section II presents a discussion of the approach taken to analyze this structure including details concerning modeling assumptions and interpretation of results. In Section III the results of the finite element modeling and detailed hand calculations are presented. Conclusions are in Section IV. The appendices include supportive material needed to verify the validity of the analysis.

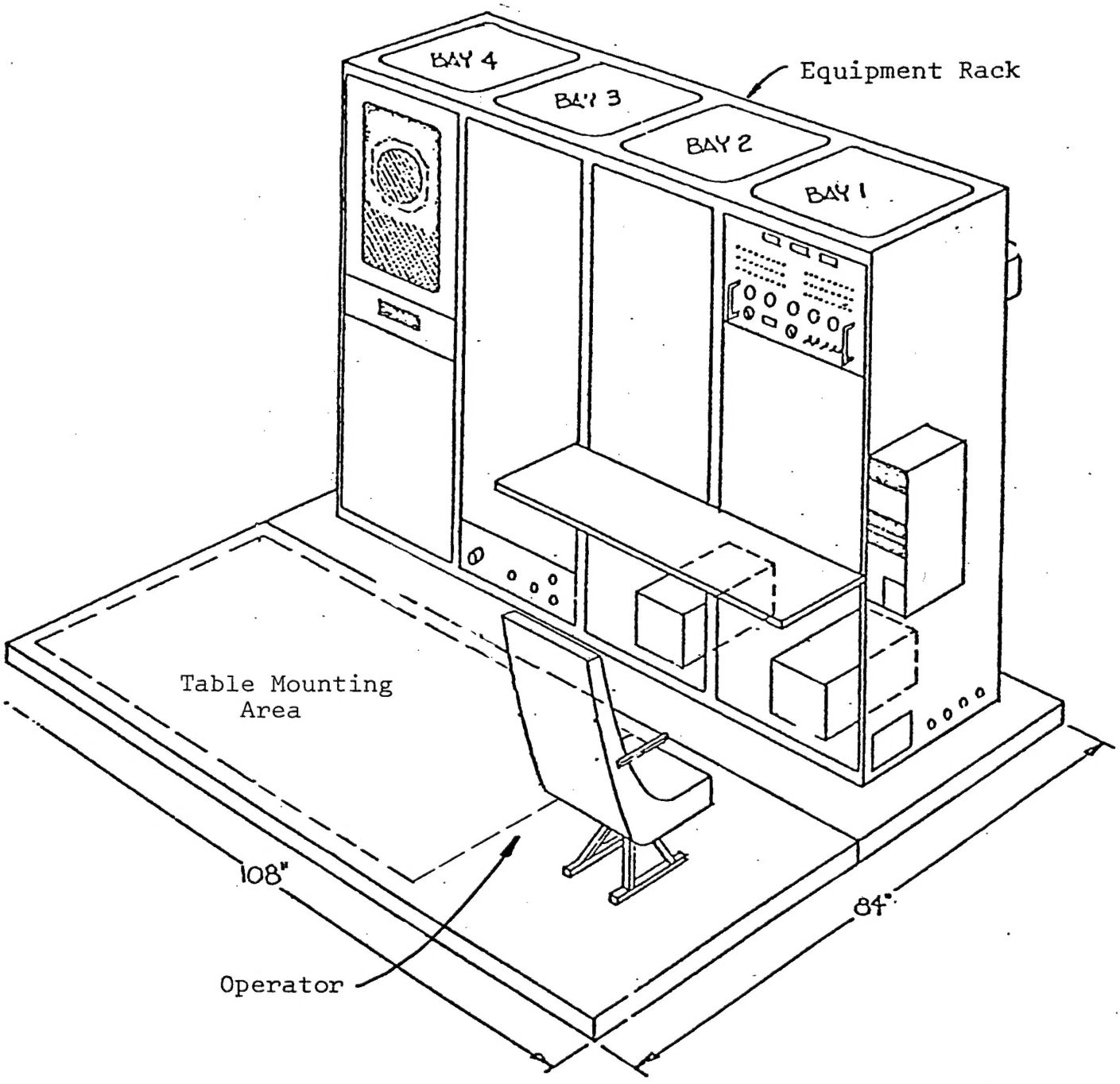


Fig. 1 Schematic of Equipment Station in Aircraft

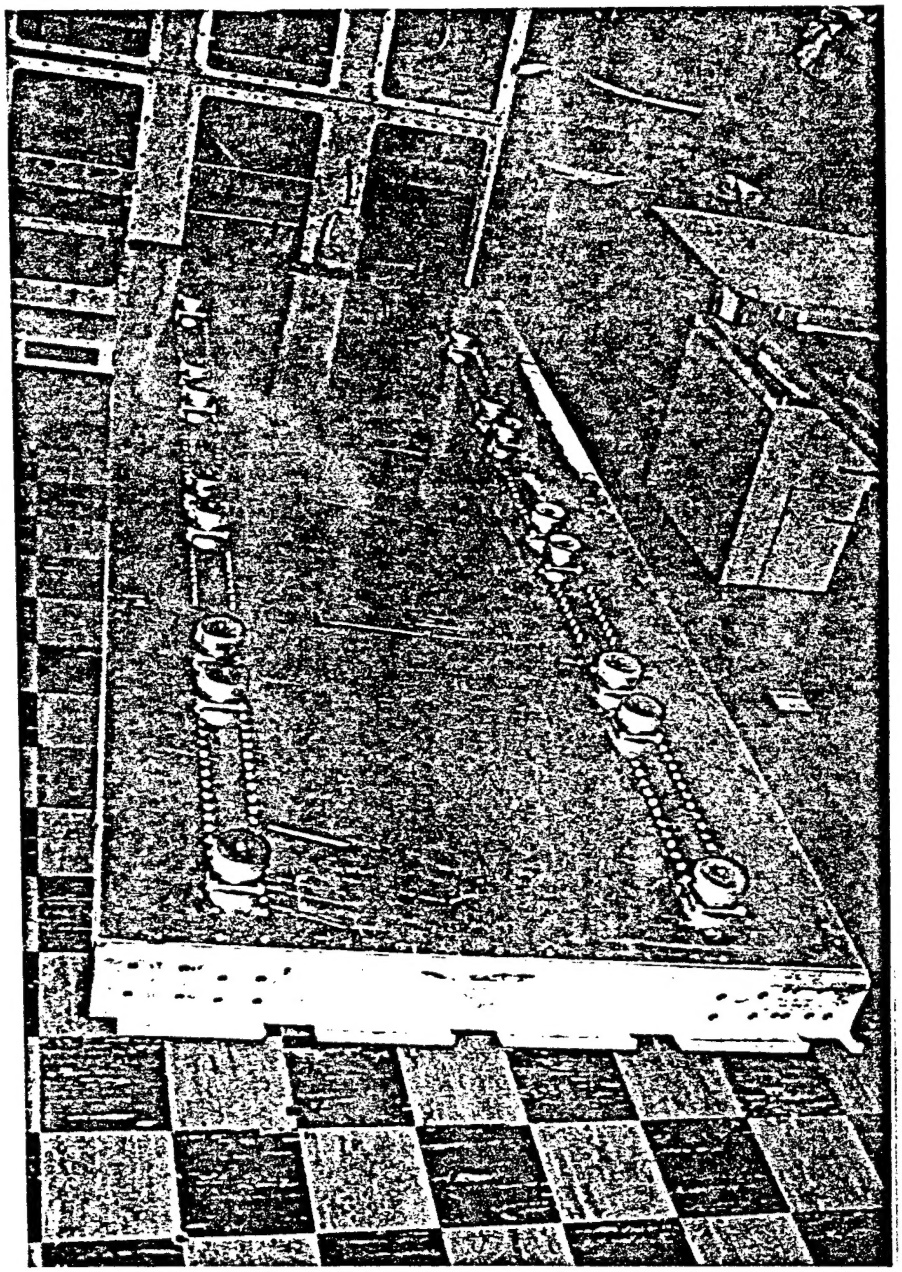


Fig. 2 Top View of Typical Pallet Showing Isolators

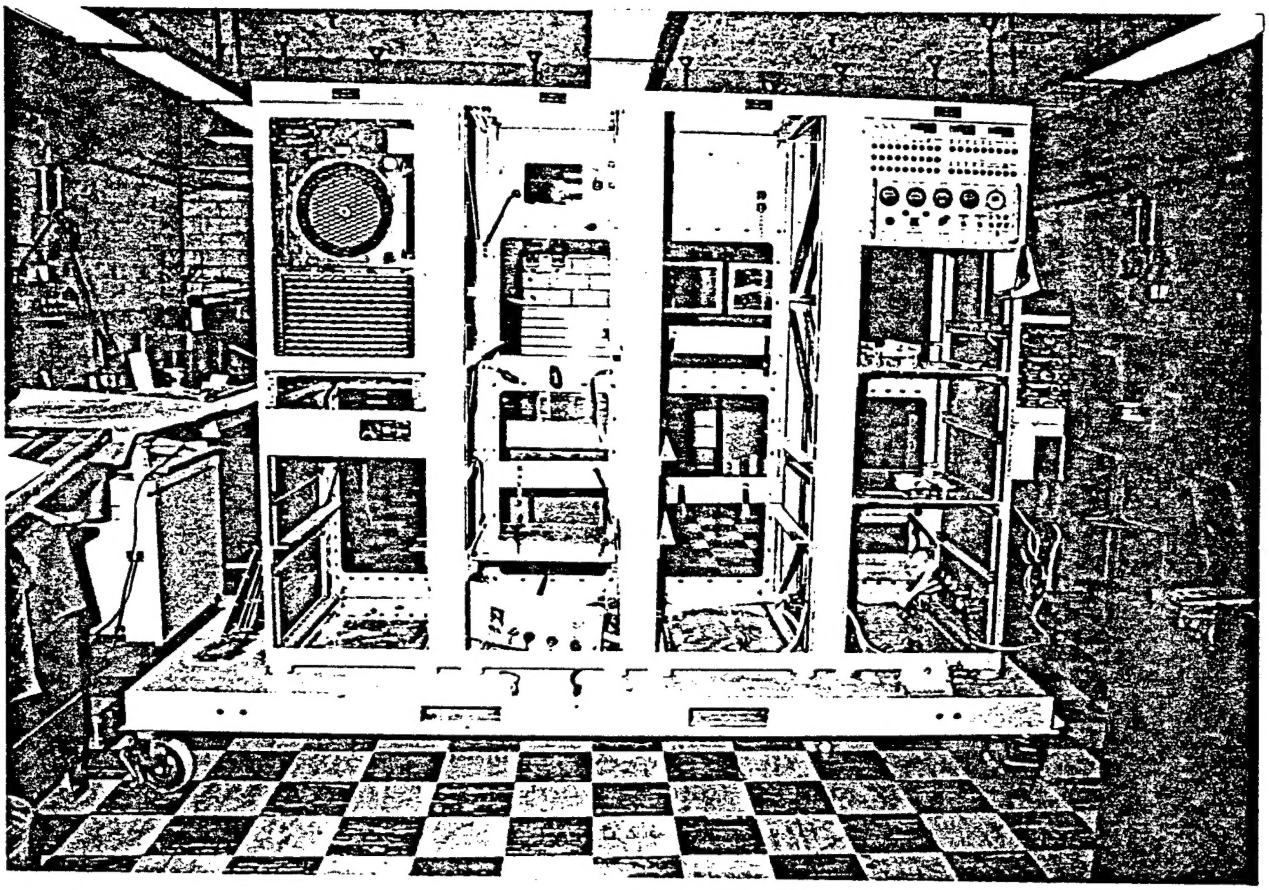


Fig. 3 Typical Equipment Rack on Pallet

II. TECHNICAL DISCUSSION

Structural analysis of this equipment station has been accomplished by using the finite element code NASTRAN in combination with detailed hand calculation stress analysis for areas that indicate either a low margin of safety or can not be adequately modeled with finite elements.

Included in the following paragraphs is detailed information concerning the items listed below:

1. Boundary conditions
2. Loads
3. Materials
4. Model discretization
5. Mass distribution of equipment
6. Presentation of results

Once placed and secured in the C141 aircraft the pallets are prevented from movement in the following manner (as described in Reference 1). The forward/aft movement is restrained by mechanisms that lock the C141 restraint rail onto the pallet edge (2 per pallet half, one on each side of pallet). Right/left and vertical up motion is prevented by the restraint rail lip that fits over the edge of the pallet. Vertical down motion is prevented by four rows of rollers that run in the forward/aft direction of the aircraft. Rollers are present along each edge and also under each fork lift tunnel. These restraints have been modeled with the use of the appropriate SPC card in NASTRAN. An SPC card in NASTRAN is used to specify a constrained degree-of-freedom at a particular node point. Under forward/aft and right/left g loadings, the pallets tend to bend and twist such that the roller supports under the tunnel may or may not be in contact with the pallet bottom. However, after an initial NASTRAN run the movement of the pallet bottom was determined and the appropriate SPC cards were used to constrain those points on the pallet which contact the rollers. For instance, nodes 86, 92, 93, and 99

are located at the edges of the pallet under the tunnel (see Figures in Appendix D). For vertical up loads these points are not SPC'd since the pallet lifts off the rollers. For vertical down loads these nodes are SPC'd since the pallet contacts the rollers. For non-vertical loads the pallet tips, and thus, two nodes must be SPC'd since the pallet contacts the rollers and the others are left free since the pallet lifts away from the rollers. For instance, for a 9 g aft load, nodes 86 and 93 are SPC'd, the others are not. In this manner, the boundary conditions for the pallet are correctly handled.

The equipment rack is loaded with 350 lb. for Bays 1 and 2 located at a center of gravity approximately half the total height of the rack. Bays 3 and 4 were loaded according to the weights and location per the technical drawings available (see Appendix A).

Several procedures have been incorporated into the modeling process to insure that the final data set used for analysis was consistent and accurate. In particular, the aspect ratio of each of the plate elements is checked to insure that element connectivity and node point location are correct. This check on the aspect ratio also insures that excessively stiff elements (due to large aspect ratio) are not utilized in the analysis. Numerous plots are also made to insure that the model has been assembled correctly and accurately represents the physical structure. Some of these plots are included in the appendices.

During the execution phase the NASTRAN program also prints out diagnostic messages to inform the user of the validity of the answers and the correctness of the data input. In particular, the quantity EPSILON as output by NASTRAN is a measure of the accuracy of the numerical solution. For all subcases and for each pallet system analyzed EPSILON was checked to insure that analytical results were accurate. Typically, EPSILON had a value in the range of 1×10^{-10} to 1×10^{-12} which indicates a good NASTRAN numerical solution.

The displacements and SPC forces printed are also checked to insure that the data input correctly represents the boundary conditions applied to the actual structure.

The loads used in the analysis are shown below and were obtained from MIL-A-8865. (Reference 2)

Forward/Aft	9 g
Right/Left	1.5 g
Vertical up	4 g
Vertical down	6 g

For the seat the following loads are used:

Forward	16 g
Aft	6 g
Right/Left	5.5 g
Vertical up	7.5 g
Vertical down	16 g

These loads were used to form 6 subcases for the NASTRAN runs. In this analysis, the stresses due to combination of orthogonal loadings is not considered or required for qualifications.

Materials used in the construction of the pallets are primarily various aluminum alloys. Properties for each particular alloy were obtained from MIL-HDBK-5. Elastic structural analysis and the appropriate elastic properties have been used.

Utilizing the drawings referenced in Appendix A, in conjunction with personal communication with knowledgeable Air Force personnel, the pallet stations were idealized as an assemblage of plates, bars, shear panels, rods, springs, etc. Sufficient elements and nodal points were incorporated into the model to insure that stress results would be very representative of the stress states in the pallet stations. Areas not adequately modeled by the finite element technique or areas that showed a low margin of safety were analyzed in detail by hand to insure adequate structural margins under the imposed

loads. The final equipment station models used are shown plotted in Appendices B, C and D.

Calculations of bar properties are presented in Appendix E along with the necessary information to determine bar offsets and stress recovery points. Areas of the pallet system that are critical in terms of their structural capability have been modeled very accurately with respect to properties and spatial position of centroids, etc. For less important areas, the increase in moment of inertia due to a bar being offset has been neglected which is a conservative assumption with respect to this structure. All margins of safety unless otherwise noted, are based on the yield properties of that material.

The stress output from NASTRAN is quite voluminous and thus is not included in this report. The output, however, will be retained at ASIAC and is available upon request. Microfiche copies of the output are included with this report. The table below lists the run identification number that corresponds to the particular run.

RUN ID	NAME	
RRA1SCS	75-0010	Seat Pallet
RRA1R1T	75-0010	Rack Pallet

The detailed stress analysis hand calculations are presented in Appendix G.

III. SUMMARY OF RESULTS

The structural adequacy for this equipment station is verified by utilizing both the finite element technique and detailed stress analysis. Both of these approaches complement each other.

The finite element analysis uses NASTRAN to calculate internal moments and forces as well as displacements and member stresses. The internal forces and moments are used in the detailed stress analysis. The member stresses are examined to determine what areas of the structure may require further analysis.

The results of the NASTRAN analysis are shown in Tables 1 through 4 for Tension and Tables 6 through 9 for Compression. The allowable stresses for the various aluminum grades are presented in Table 5. Subcase numbers correspond as follows:

Subcase No. 1	9 g aft
Subcase No. 2	9 g forward
Subcase No. 3	6 g down
Subcase No. 4	4 g up
Subcase No. 5	1.5 g left
Subcase No. 6	1.5 g right

The margins of safety presented in these tables are based on yield strength of the material. As can be seen, there are no negative margins.

The detailed stress analysis (See Appendix G) is used to examine areas of the structure that have:

(1) Low margins of safety in tension.

(2) Low margins in compression where buckling phenomenon may be of concern.

(3) Areas not modeled adequately by the finite element technique.

(4) Fasteners, bolted joints, etc., which are not modeled.

TABLE 1

STRESSES AND MARGINS OF SAFETY FOR TENSION IN SEAT PALLET*

Element No.	Load Case (Subcase No.)	Max. Stress (Psi.)	Margin of Safety
1028	1	13,826	+2.0
1036	1	18,675	+1.2
1605	1	18,482	+1.3
1607	1	18,647	+1.3
1608	1	17,874	+1.3
1615	1	15,702	+1.7
1616	1	15,740	+1.7
2044	1	20,292	+1.1
2045	1	23,837	+ .8
2050	1	17,077	+1.5
2051	1	18,878	+1.2
1029	2	14,041	+2.0
1037	2	25,278	+ .7
2042	2	19,432	+1.2
2043	2	17,414	+1.4
2048	2	19,051	+1.2
2049	2	18,005	+1.3
1615	3	18,018	+1.3

* For margins less than or equal to 2.0

TABLE 2

STRESSES AND MARGINS OF SAFETY FOR TENSION IN RACK PALLET *

Element No.	Load Case (Subcase No.)	Max. Stress (Psi.)	Margin of Safety
3005	1	27,704	+ .5
3008	1	28,521	+ .5
3031	1	26,241	+ .6
3039	1	23,676	+ .8
3047	1	22,813	+ .5
3083	1	16,953	+1.0
3089	1	16,522	+1.0
3095	1	29,250	+ .4
3096	1	27,755	+ .5
3600	1	27,160	+ .6
3603	1	26,123	+ .6
3606	1	20,914	+1.0
4017	1	20,639	+1.0
3017	2	27,297	+ .5
3020	2	29,433	+ .4
3031	2	36,072	+ .2
3039	2	32,736	+ .3
3052	2	23,185	+ .4
3088	2	17,158	+ .9
3094	2	16,922	+1.0
3611	2	27,018	+ .6
4005	2	20,924	+1.0
4095	2	26,662	+ .6
4098	2	24,527	+ .7

* For margins less than or equal to 1.0

TABLE 3

STRESSES AND MARGINS OF SAFETY FOR TENSION IN EQUIPMENT RACK *

Element No.	Load Case (Subcase No.)	Max. Stress (Psi.)	Margin of Safety
264	1	23,633	+ .8
444	1	17,036	+ .9
461	1	18,782	+ .8
464	1	18,670	+ .8
465	1	18,358	+ .8
466	1	16,870	+1.0
467	1	17,087	+ .9
468	1	16,104	+1.0
469	1	17,616	+ .9
470	1	17,237	+ .9
472	1	16,484	+1.0
475	1	17,104	+ .9
477	1	18,119	+ .8
478	1	20,263	+ .6
479	1	17,956	+ .8
482	1	18,766	+ .8
483	1	16,645	+1.0
485	1	24,504	+ .4
362	2	28,854	+ .5
363	2	23,495	+ .8
366	2	27,735	+ .5
367	2	22,961	+ .8
461	2	29,003	+ .1
463	2	24,654	+ .3
466	2	21,765	+ .5
469	2	17,798	+ .9
472	2	20,470	+ .6
475	2	22,679	+ .5
478	2	17,964	+ .8
480	2	22,292	+ .5
481	2	22,052	+ .5
482	2	30,844	+ .7
362	5	21,250	+1.0
366	5	21,935	+ .9
370	5	20,968	+1.0
364	6	20,793	+1.0
367	6	20,532	+1.0
368	6	21,676	+ .9

* For margins less than or equal to 1.0

TABLE 4

STRESSES AND MARGINS OF SAFETY FOR TENSION IN SEAT PALLET TABLE*

Element No.	Load Case (Subcase No.)	Max. Stress (Psi.)	Margin of Safety
2247	2	14,687	+1.9
2250	2	21,225	+1.0
2257	2	30,064	+ .4
2263	2	15,752	+1.7
2266	2	16,619	+1.5
2267	2	27,158	+ .6
2268	2	16,437	+1.6
2229	1	28,676	+ .5
2257	1	22,406	+ .9
2267	1	18,104	+1.3
2266	1	22,791	+ .8
2262	1	16,718	+1.5

*For margins less than or equal to 2.0

TABLE 5

MATERIAL PROPERTIES OF ALUMINUM*

Property	Sheet 2024-T3	Extruded 6061-T6	Extruded 2024-T3
E (x 10^6 psi)	10.50	9.90	10.8
G** (x 10^6 psi)	3.95	3.72	4.06
μ	0.33	0.33	0.33
w (lbf/in^3)	0.100	0.098	0.100
F_{tu} (psi)	63,000	37,000	54,000
F_{ty} (psi)	42,000	33,000	37,000
F_{cy} (psi)	39,000	35,000	34,000
F_{su} (psi)	39,000	27,000	29,000
F_{bru} (psi) $\frac{e}{D} = 1.5$	106,000	64,000	84,000
$\frac{e}{D} = 2.0$	131,000	82,000	108,000
F_{bry} (psi) $\frac{e}{D} = 1.5$	73,000	54,000	61,000
$\frac{e}{D} = 2.0$	88,000	60,000	108,000

* MIL-HDBK-5

** As determined by NASTRAN code using $G = \frac{E}{2(1+\mu)}$

TABLE 6

STRESSES AND MARGINS OF SAFETY FOR COMPRESSION IN SEAT PALLET*

Element No.	Load Case (Subcase No.)	Max. Stress (Psi.)	Margin of Safety
1029	1	14,292	+1.7
1037	1	25,389	+ .5
2042	1	19,678	+1.0
2043	1	17,812	+1.2
2048	1	19,002	+1.1
2049	1	18,082	+1.2
1028	2	14,012	+1.8
1605	2	15,968	+1.4
1607	2	18,508	+1.1
1608	2	17,143	+1.3
1615	2	19,003	+1.1
1616	2	16,201	+1.4
2044	2	20,699	+ .9
2045	2	24,167	+ .6
2050	2	17,121	+1.3
2051	2	18,799	+1.1
1615	3	18,304	+ .7

*For margins less than or equal to 2.0

TABLE 7

STRESSES AND MARGINS OF SAFETY FOR COMPRESSION IN RACK PALLET *

Element No.	Load Case (Subcase No.)	Max. Stress (Psi.)	Margin of Safety
3005	1	20,286	+ .9
3031	1	35,882	+ .1
3039	1	32,352	+ .2
3052	1	19,897	+ .8
3095	1	20,699	+ .9
3096	1	21,805	+ .8
3600	1	24,620	+ .6
3603	1	26,080	+ .5
3017	2	22,292	+ .8
3020	2	22,445	+ .7
3031	2	27,358	+ .4
3039	2	24,897	+ .6
3047	2	19,083	+ .8
3097	2	23,858	+ .6
3098	2	23,681	+ .7
3592	2	25,869	+ .5
3611	2	24,449	+ .6
4095	2	21,040	+ .9

* For margins less than or equal to 1.0

TABLE 8

STRESSES AND MARGINS OF SAFETY FOR COMPRESSION IN EQUIPMENT RACK*

Element No.	Load Case (Subcase No.)	Max. Stress (Psi.)	Margin of Safety
251	1	21,769	+ .8
362	1	23,260	+ .7
363	1	21,184	+ .8
364	1	25,833	+ .5
366	1	25,173	+ .6
367	1	20,196	+ .9
443	1	17,652	+1.0
461	1	19,656	+ .8
462	1	18,984	+ .8
463	1	25,493	+ .4
466	1	24,801	+ .4
469	1	24,277	+ .4
472	1	26,124	+ .3
475	1	23,396	+ .5
478	1	17,331	+1.0
480	1	23,582	+ .4
481	1	23,285	+ .5
482	1	23,932	+ .5
260	2	20,774	+ .9
262	2	21,509	+ .8
264	2	21,683	+ .8
444	2	20,409	+ .7
461	2	23,631	+ .5
464	2	18,992	+ .8
465	2	19,302	+ .8
468	2	18,380	+ .9
474	2	20,066	+ .7
477	2	18,747	+ .9
478	2	20,793	+ .7
479	2	18,257	+ .9
482	2	22,709	+ .5
483	2	19,542	+ .8
364	5	21,027	+ .9
367	5	20,566	+ .9
368	5	21,712	+ .8
372	5	20,779	+ .9
362	6	21,006	+ .9
363	6	20,138	+ .9
366	6	21,787	+ .8
367	6	20,781	+ .9

* For margins less than or equal to 1.0

TABLE 9

STRESSES AND MARGINS OF SAFETY FOR COMPRESSION IN SEAT PALLET TABLE*

Element No.	Load Case (Subcase No.)	Max. Stress (Psi.)	Margin of Safety
2229	1	18,441	+1.1
2247	1	14,580	+1.7
2250	1	21,354	+ .8
2257	1	30,327	+ .3
2263	1	15,558	+1.5
2266	1	16,502	+1.4
2267	1	26,895	+ .5
2268	1	16,539	+1.4
2229	2	28,484	+ .4
2250	2	13,123	+2.0
2257	2	22,280	+ .8
2262	2	16,742	+1.3
2266	2	22,862	+ .7
2267	2	18,090	+1.2
2253	6	13,089	+2.0

*For margins less than or equal to 2.0

IV. CONCLUSIONS

A structural analysis of equipment station 75-0010 has been performed. Both finite element and detailed hand calculations were employed in order to determine the stresses and margins of safety. Crash loadings as specified in MIL-A-8865 were used.

For equipment station 75-0010, the lowest margins of safety and their corresponding locations are as follows:

Seat Rail Flange	+.20
Seat pallet table	+.30
Internal Diagonal connection, vertical extrusion	+.48
Clips	+.50
Corner bolting	+.53
Equipment rack clip, 2 bolt section	+.57
Table bolts at vertical column connection	+.59
Seat rail support beams	+.60

The results show that under the specified loads and for the given pallet-attached structures, the pallets and equipment rack retain their structural load carrying capability.

REFERENCES

1. Letter from Paul A. Riemer, AMDA to 4950/AMS Concerning "6585TG Submittal of PDMM Drawings dated 1 Sept. 1977," letter dated 9 Sept. 1977.

2. MIL-A-8865

3. Baker, E. H, Kovalesky, L, and Rish, F. L., Structural Analysis of Shells, McGraw Hill Book Company, New York 1972.

4. Communication with Dan Scott, U.S.A.F., Holloman AFB, 6585th Test Group.GDLC. Tests performed by Dan Scott.

5. INERTIA User's Guide, Anamet Report No. 1077.556.

APPENDIX A

TABULATION OF TECHNICAL DRAWINGS

FOR EQUIPMENT STATION 75-0010

TABULATION OF TECHNICAL DRAWINGS

Description	U. S. Air Force Drawing Number
CIRIS Block Diagram	77XEE-1154
CIRIS Interconnect Cables	77XEE-1155
Mars Recorder, CC301 & Doppler Cables	77XEF-1156
CIRIS Interconnect Cable W14	77XEF-1157
Cains Interconnect Cables	77XEE-1158
Seat Power Distribution	77XEE-1159
Power Distribution and Control	77XEE-1160
CC301 Shelf Installation	77XMF-1166
Seat Equipment Installation (Front)	77XME-1170
Seat Equipment Installation	77XME-1170
Seat Equipment Installation (Back)	77XME-1170
CIU Installation	77XMC-1171
Cabinet Slide Detail (Left Side)	77XMF-1172
Unitron Slide Detail (Left Side)	77XMF-1173
Mars Recorder Installation	77XMF-1174
CC301 Installation	77XMF-1175
Rack Equipment Identification	77XME-1176
Rack Equipment Installation	77XME-1177
Unitron Installation (400 ~ 30 to 60 ~ 10)	77XME-1177
Equipment Installation (Bay #2)	77XME-1177
Computer and Disc Installation	77XME-1177
Air Conditioner Installation	77XME-1177
Tape Drive and I/O Extender	77XME-1177

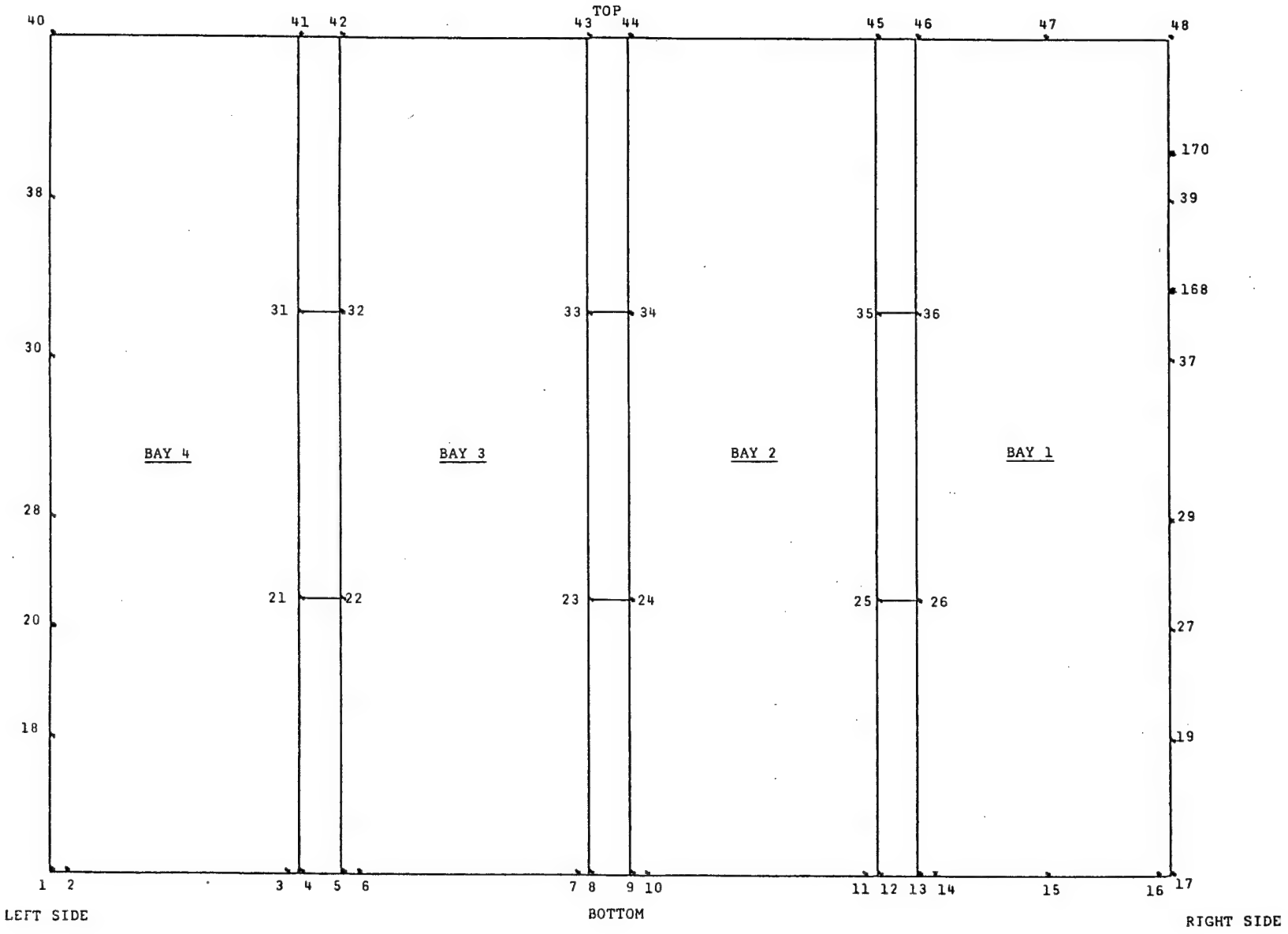
TABULATION OF TECHNICAL DRAWINGS (cont'd)

Description	U. S. Air Force Drawing Number
Power Distribution and Control Panel	77XME-1177
Hard Copier Installation	77XME-1177
CIRIS Cargo Pallets	77XME-1161
Plate & Seat to Pallet Attachment (PDMM only)	77XME-1162
Seat Pallet	77XME-1162
Seat Pallet Detail	77XME-1162
Equipment Rack Pallet	77XME-1163
CIRIS Half Pallet (Seat)	77XME-1164
Plate Installation (Item 26)	77XMF-1165

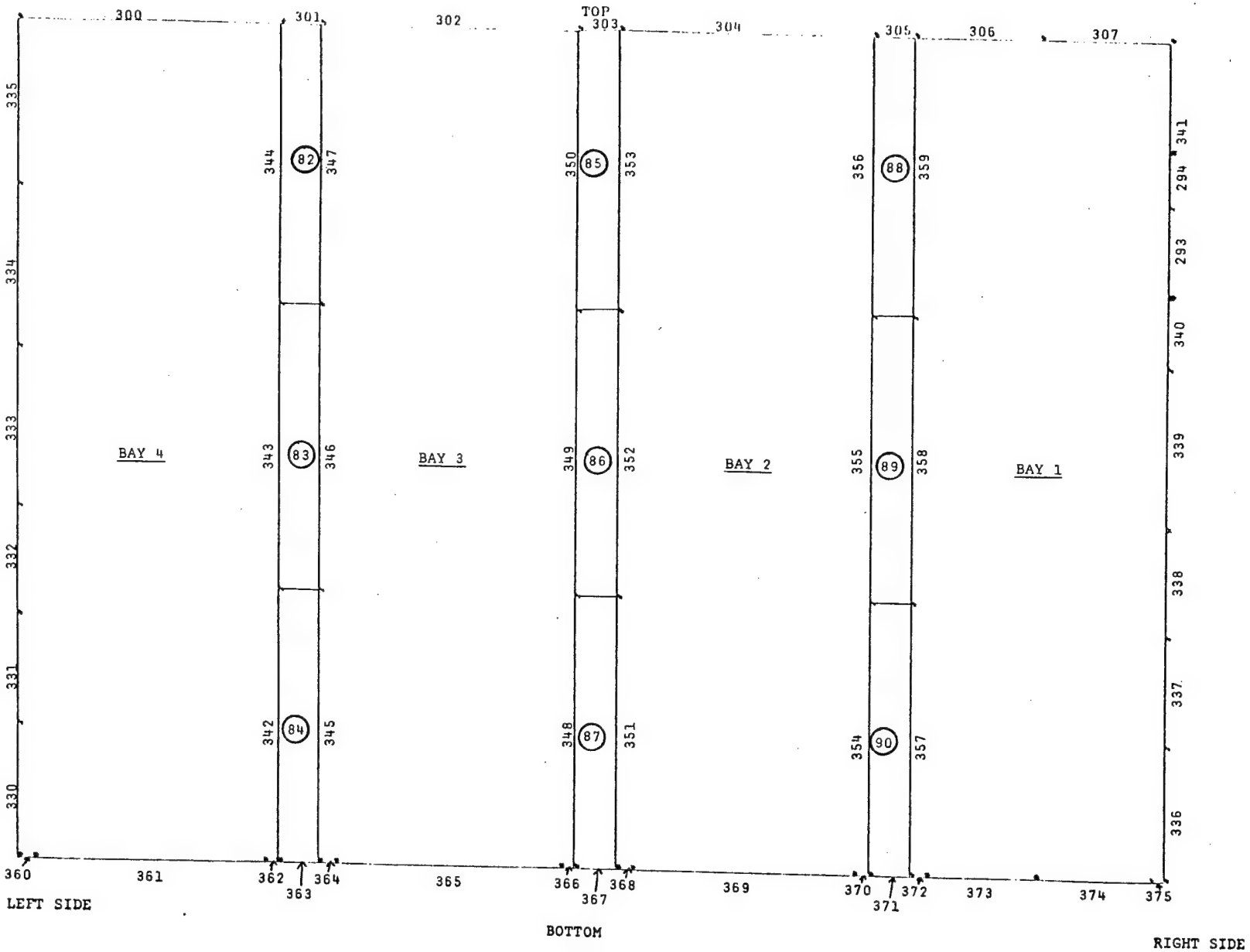
APPENDIX B

FINITE ELEMENT MODEL OF EQUIPMENT RACK

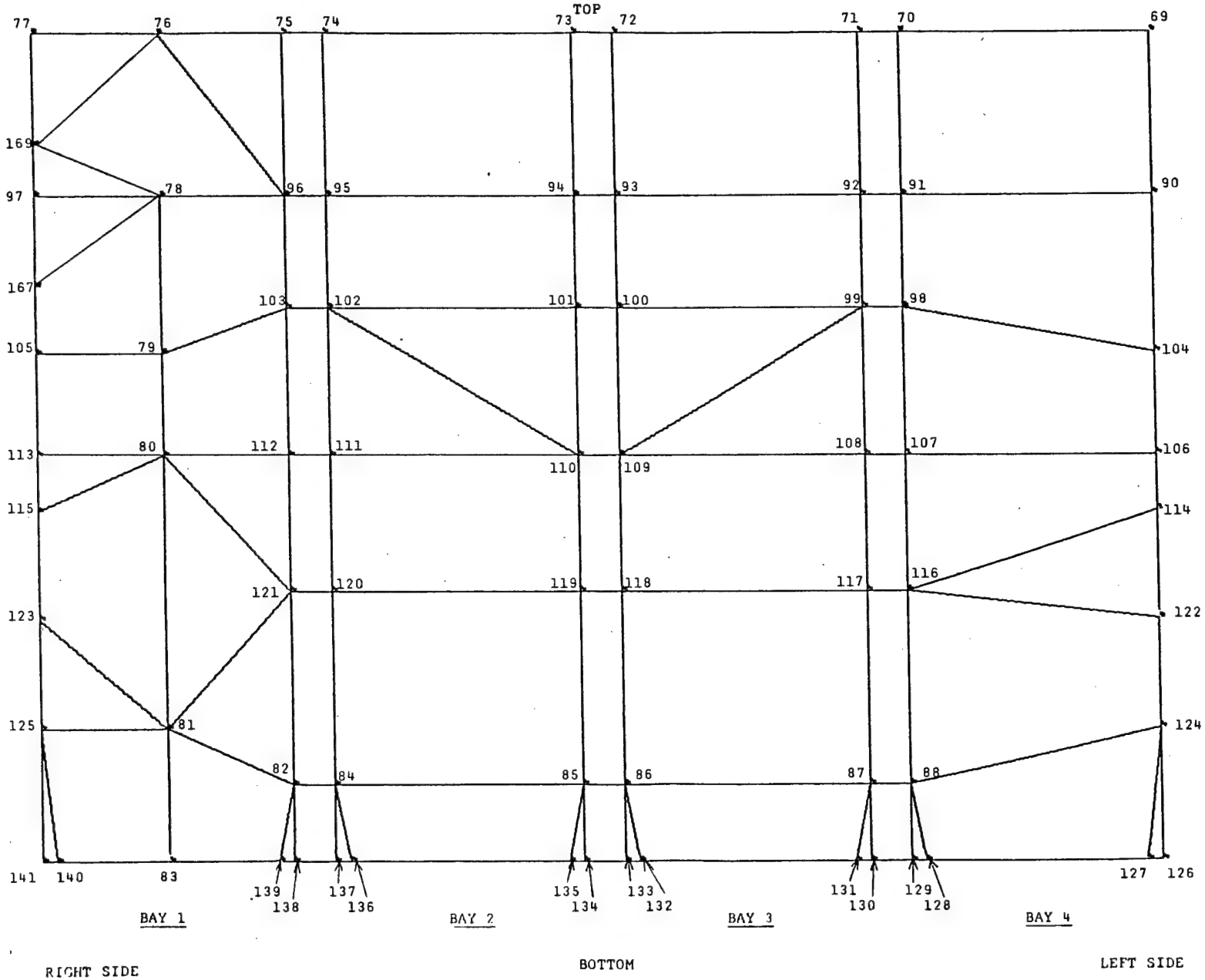
In this appendix, plots of the equipment rack model are presented. The model contains almost 1100 degrees of freedom, with 185 grid points, 300 bars, and 151 plate elements.



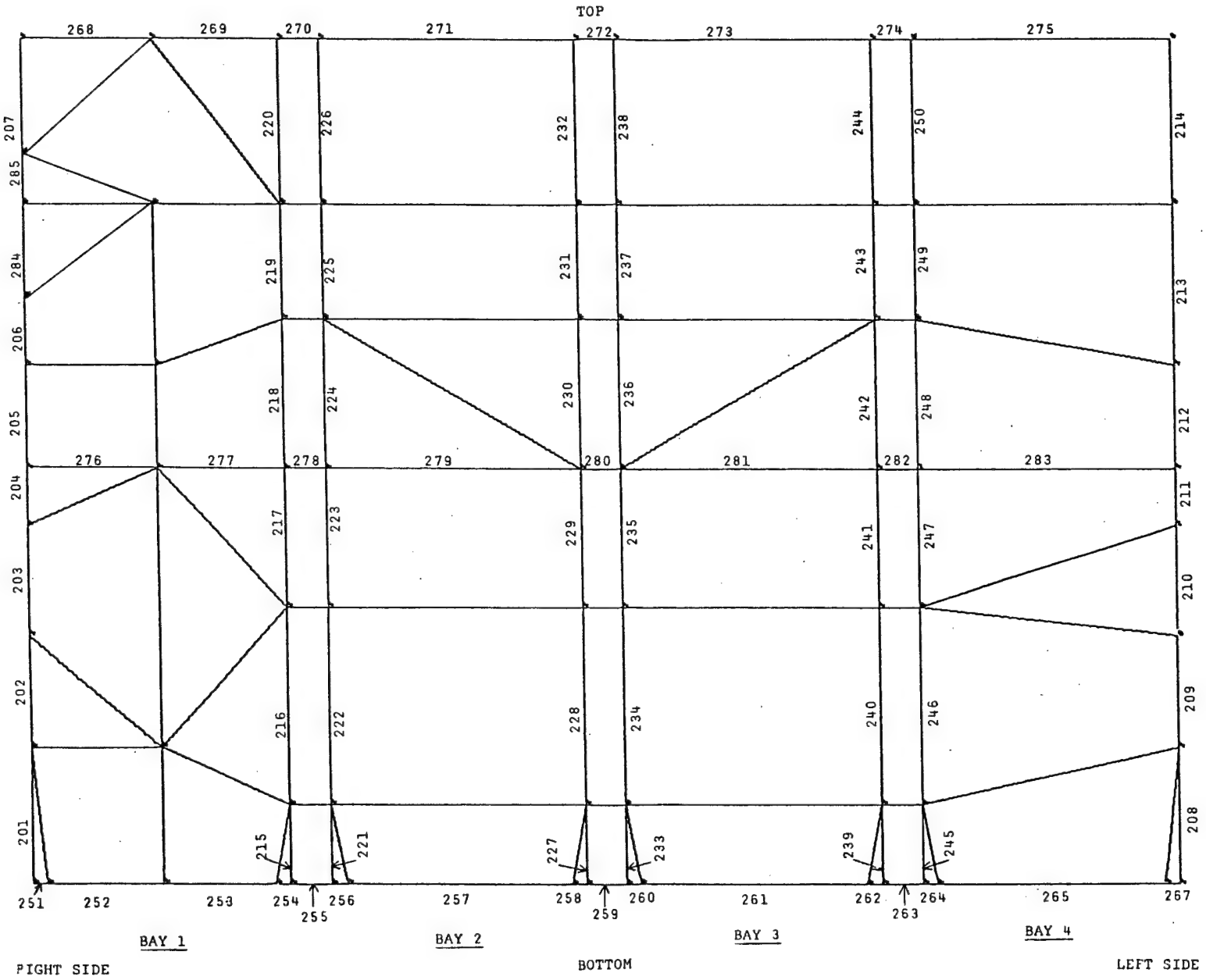
Front Structure, Equipment Rack, Grid Points



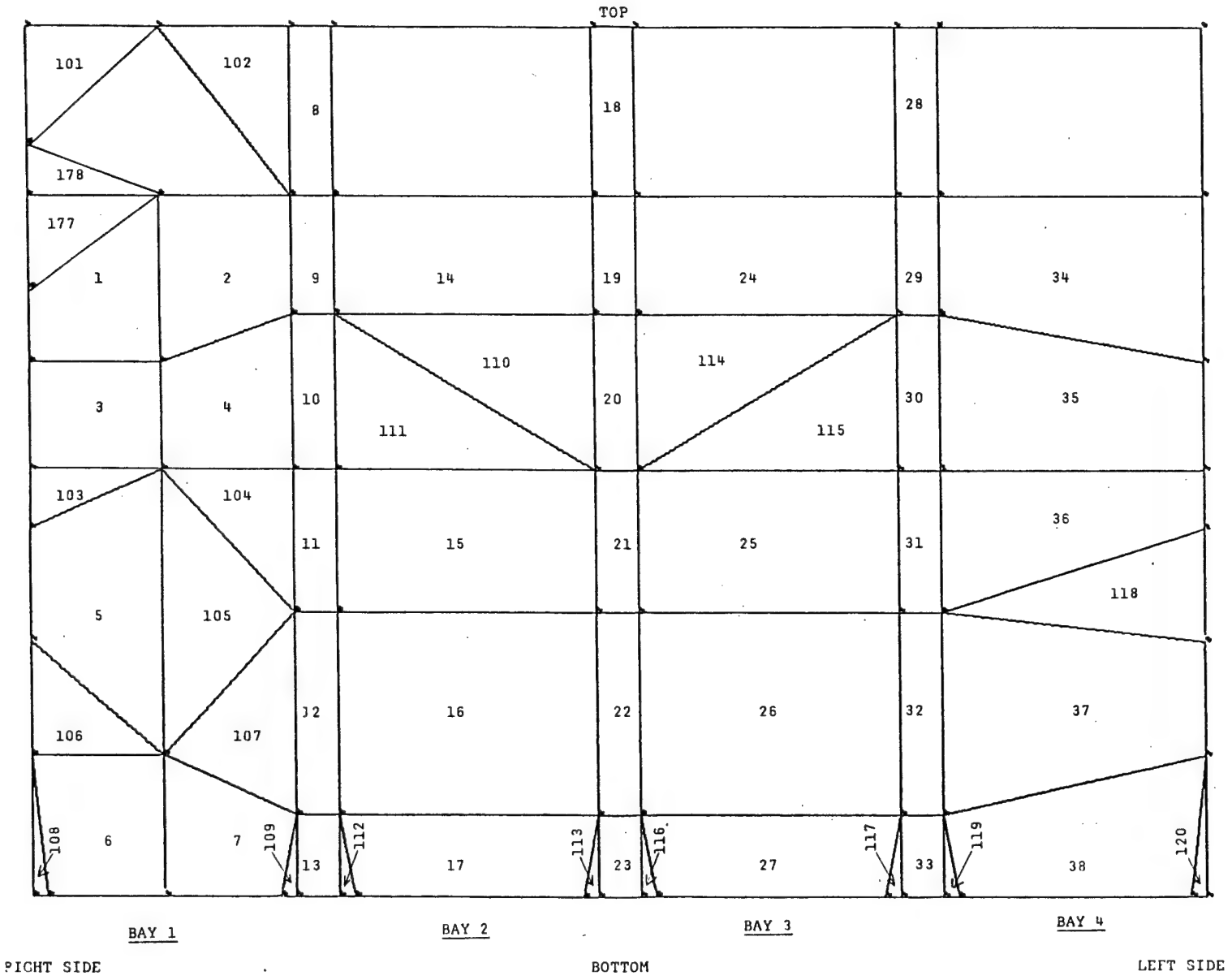
Front structure, Equipment Rack, Bar and Plate Elements



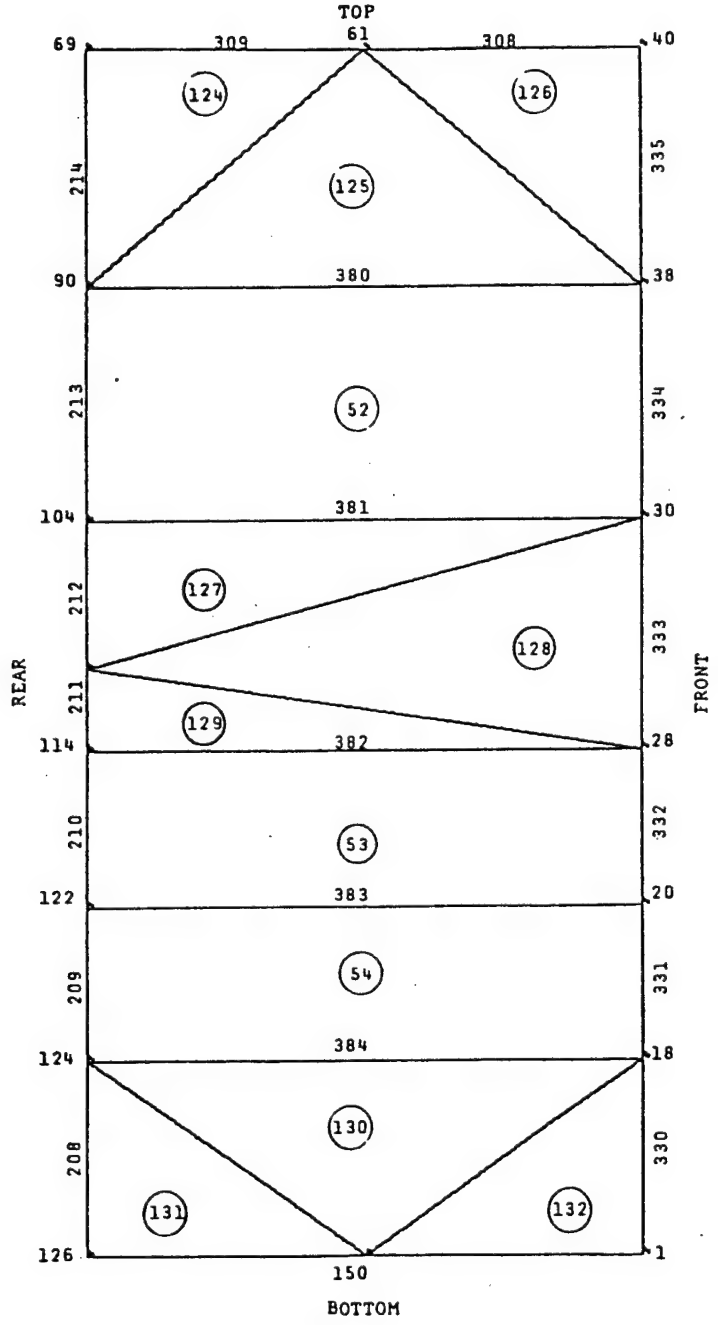
Back Structure, Rear View, Equipment Rack, Grid Points



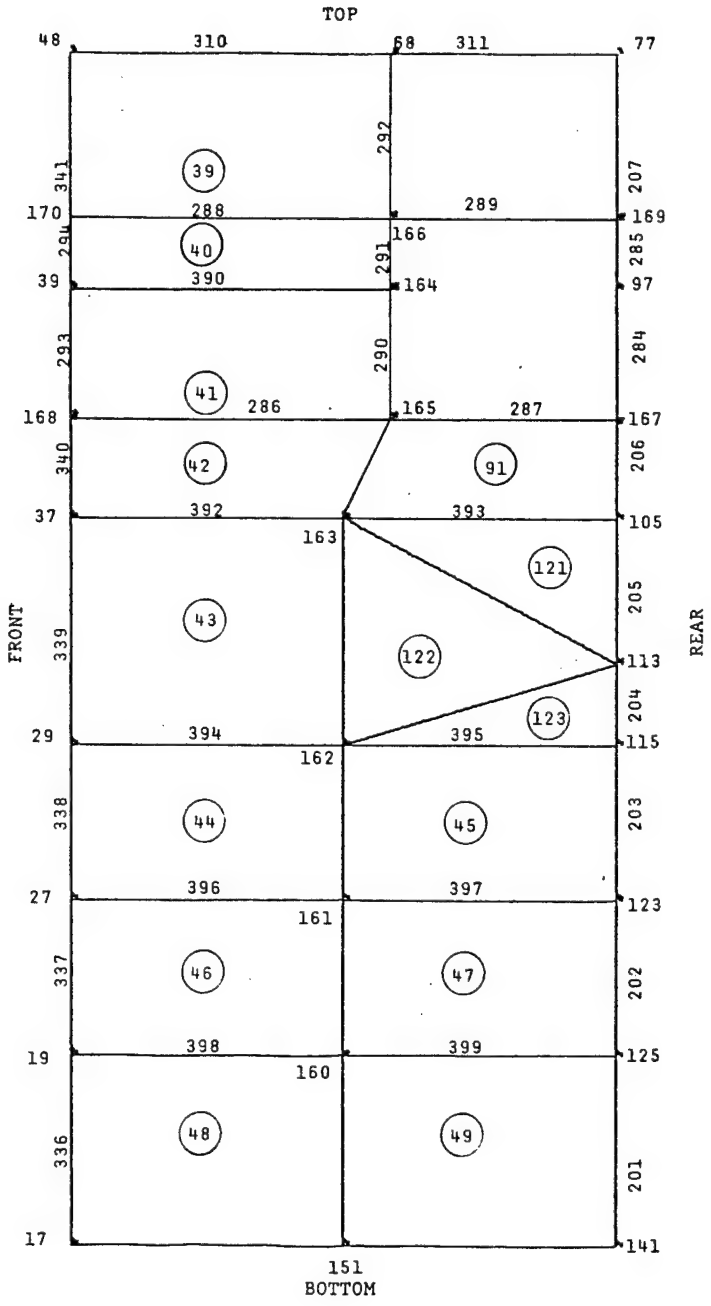
Back Structure, Rear View, Equipment Rack, Bar Elements



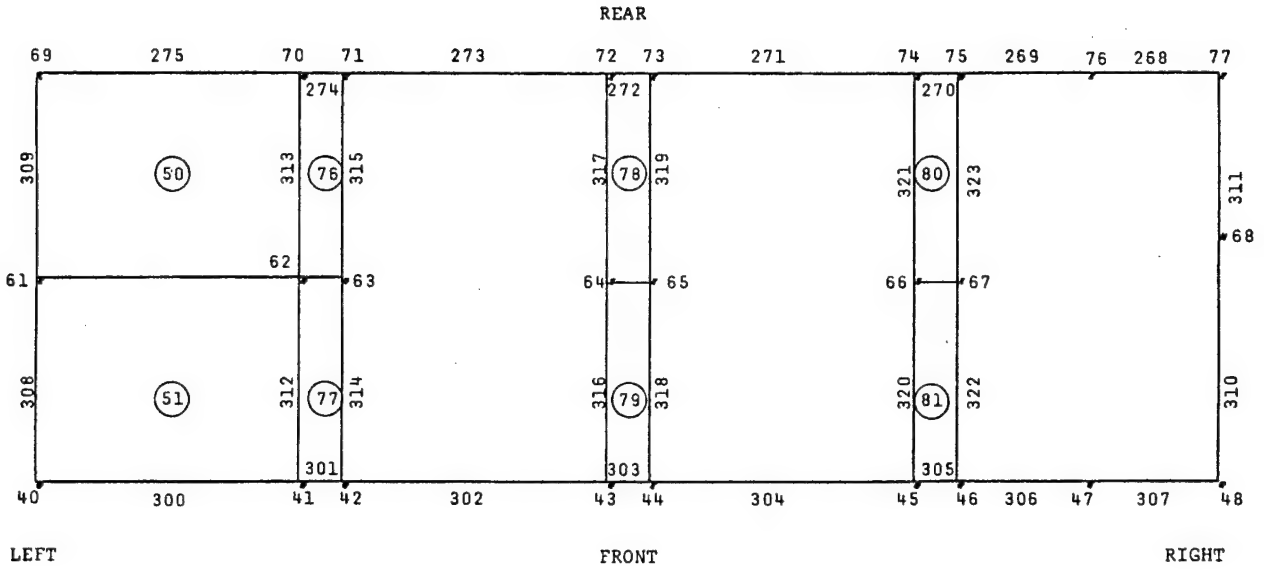
Back Structure, Rear View, Equipment Rack, Plate Elements



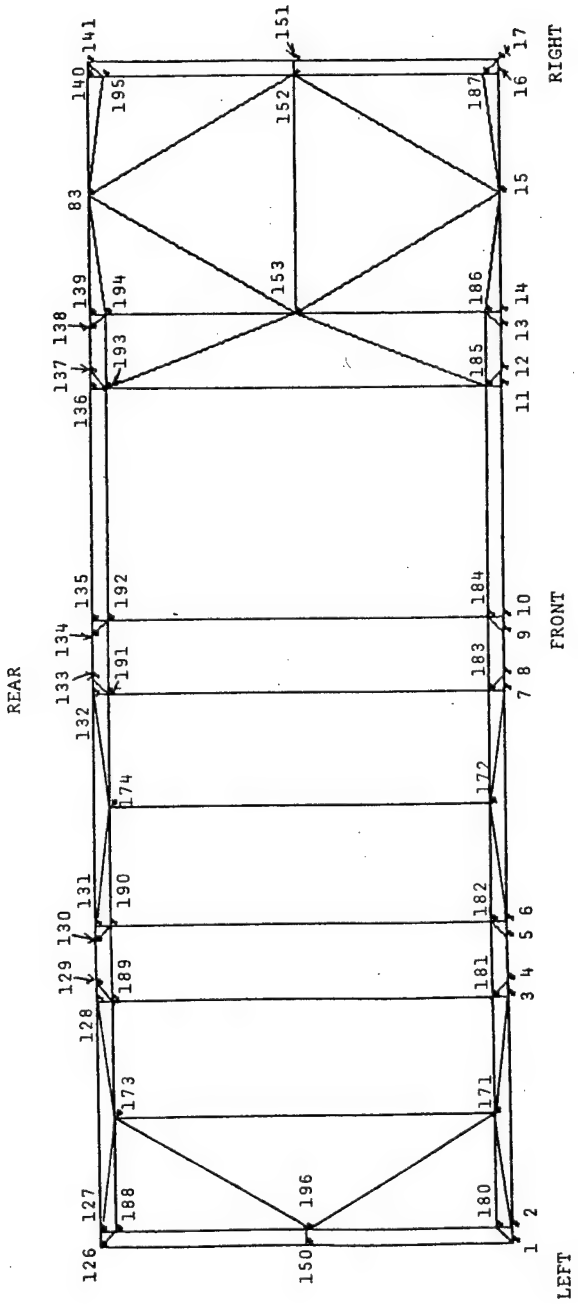
Left Side Structure, Equipment Rack,
Bar and Plate Elements and Grid Points



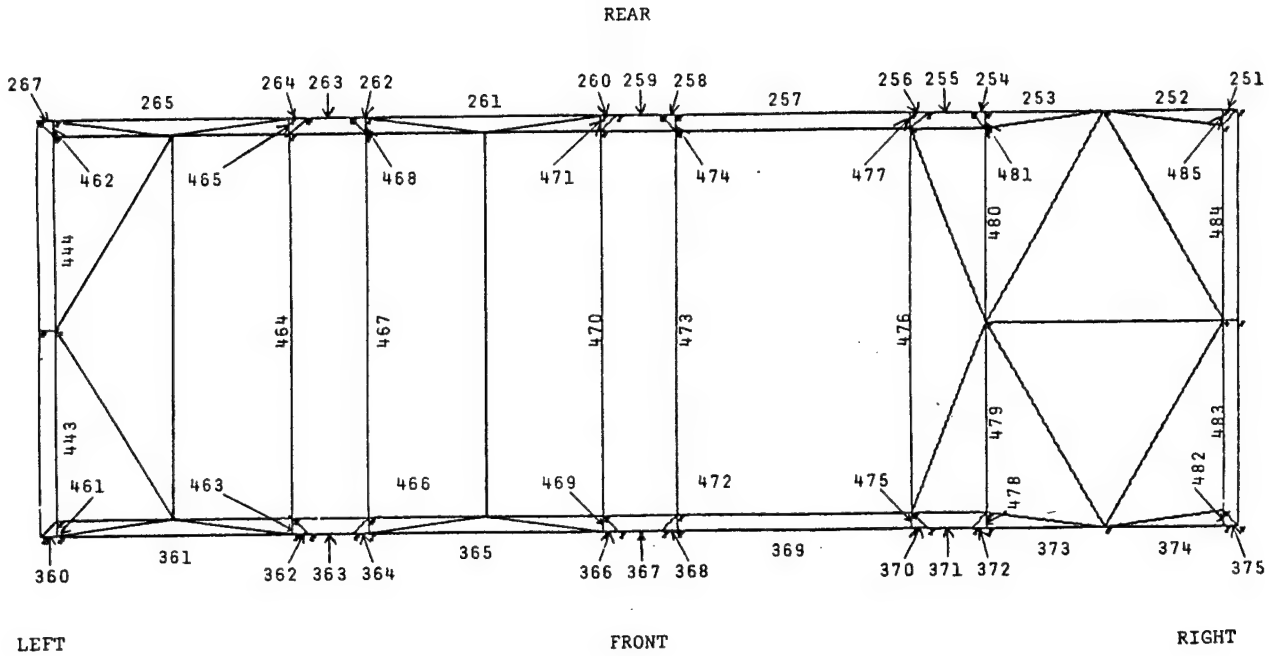
Right Side Structure, Equipment Rack,
Bar and Plate Elements and Grid Points



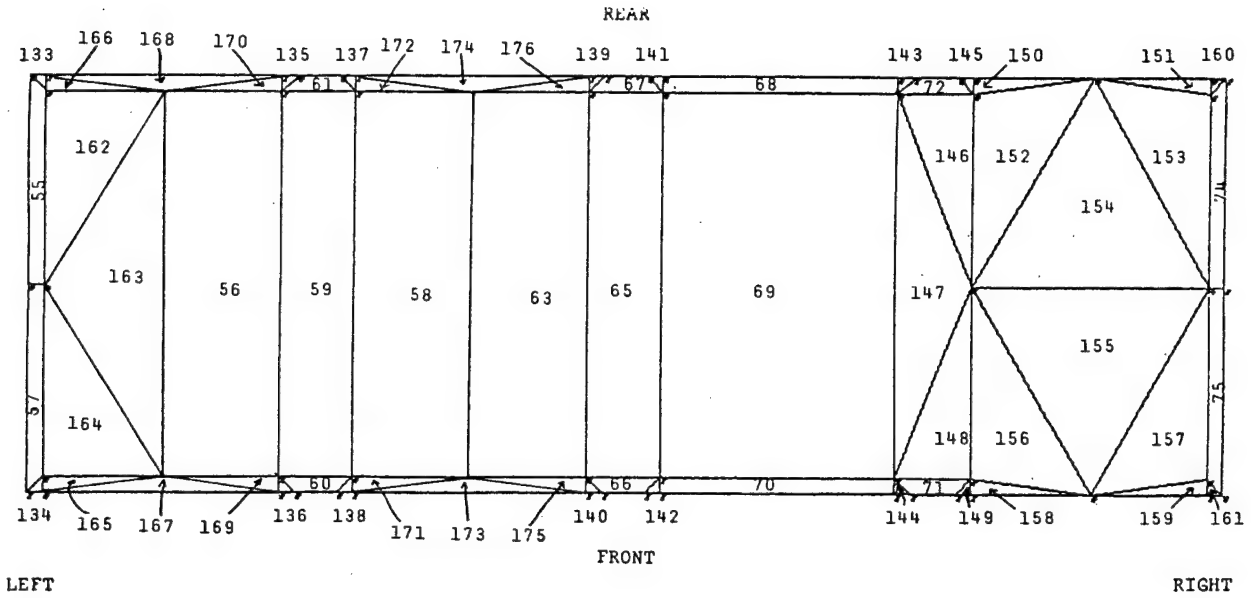
Roof Structure, Top View, Equipment Rack,
Bar and Plate Elements and Grid Points



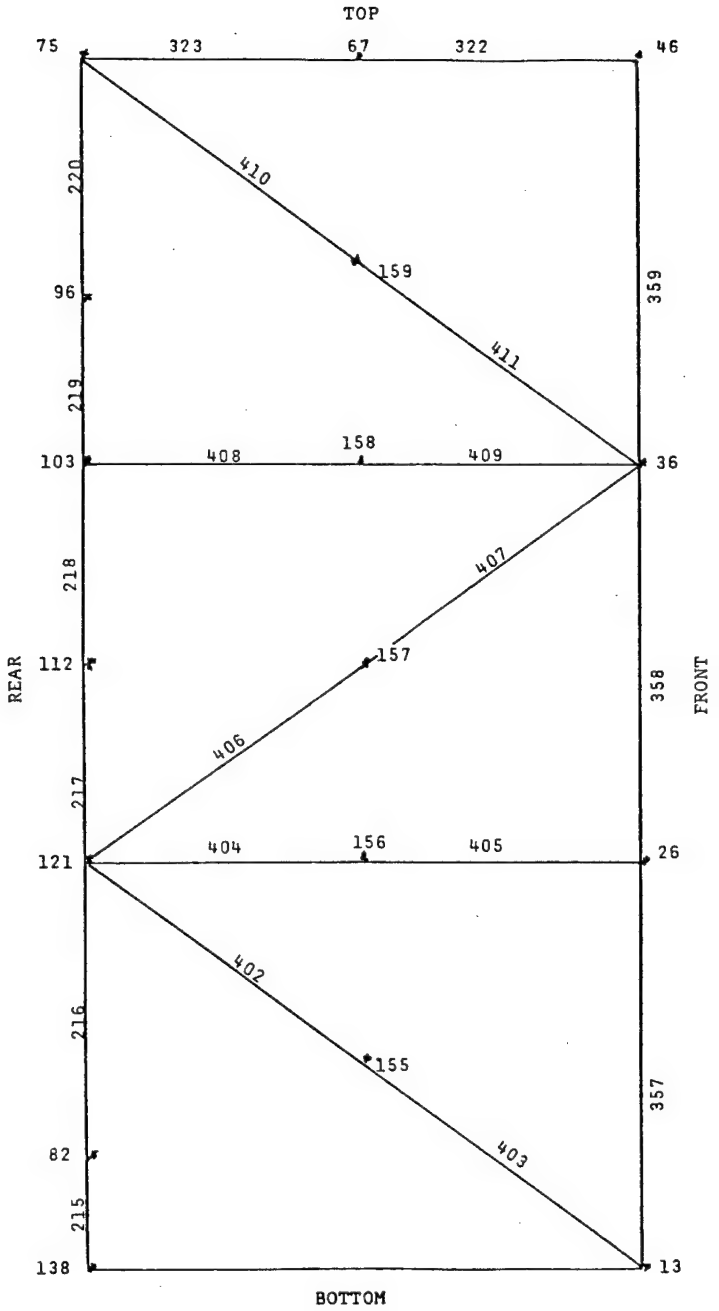
Floor Structure (Looking down from top),
Equipment Rack, Grid Points



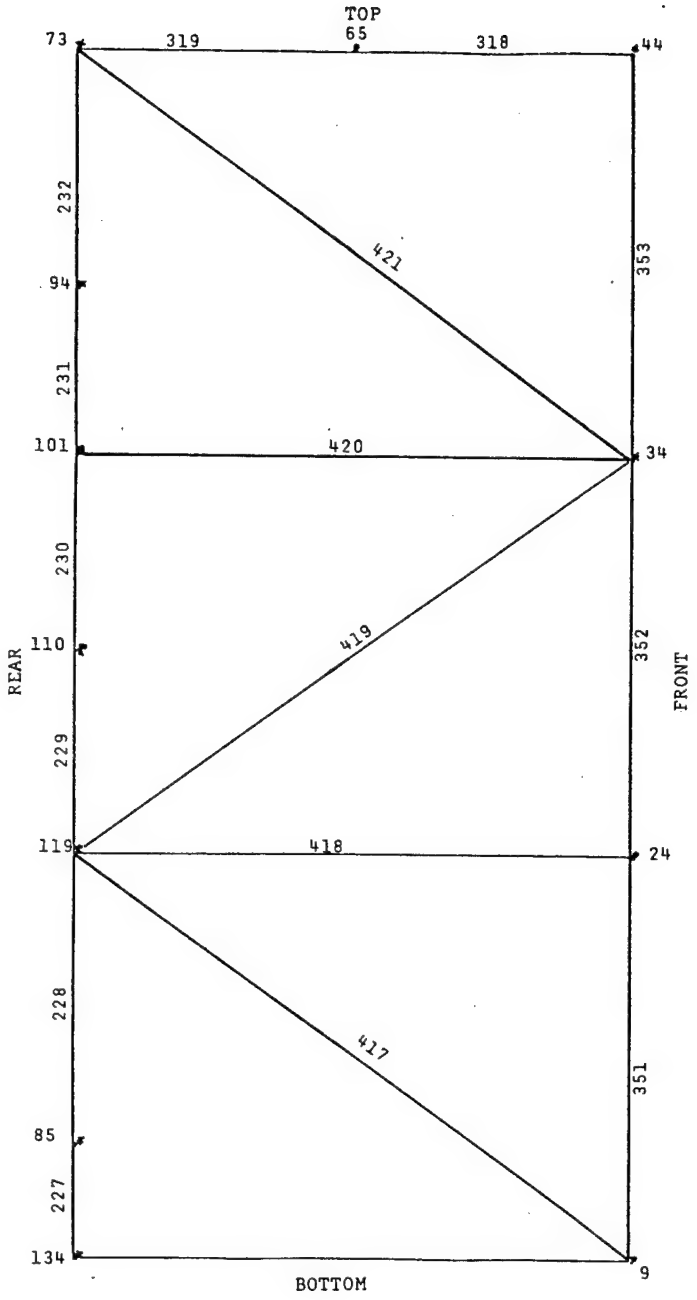
Floor Structure, (Looking down from top), Equipment Rack Bar Elements



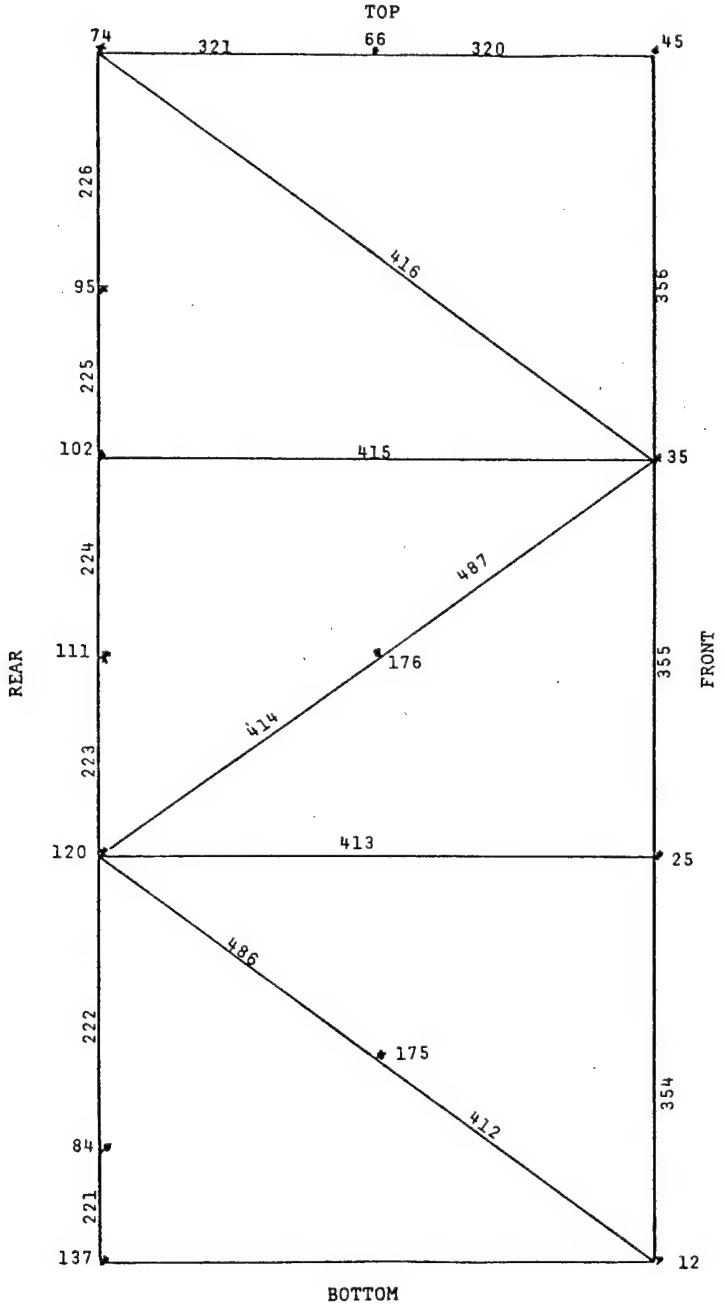
Floor Structure (Looking down from top), Equipment Rack Plate Elements



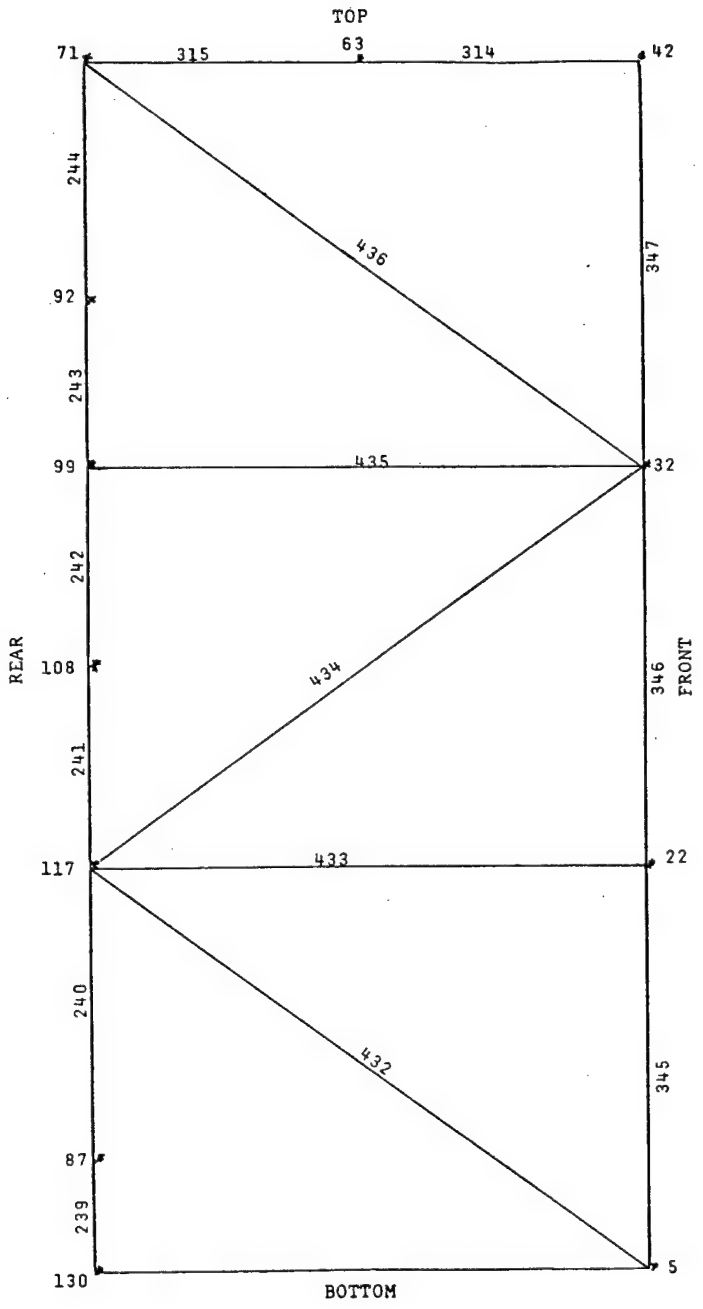
Intermediate Bracking Structure, LHS Bay 1,
Equipment Rack, Bar Elements and Grid Points



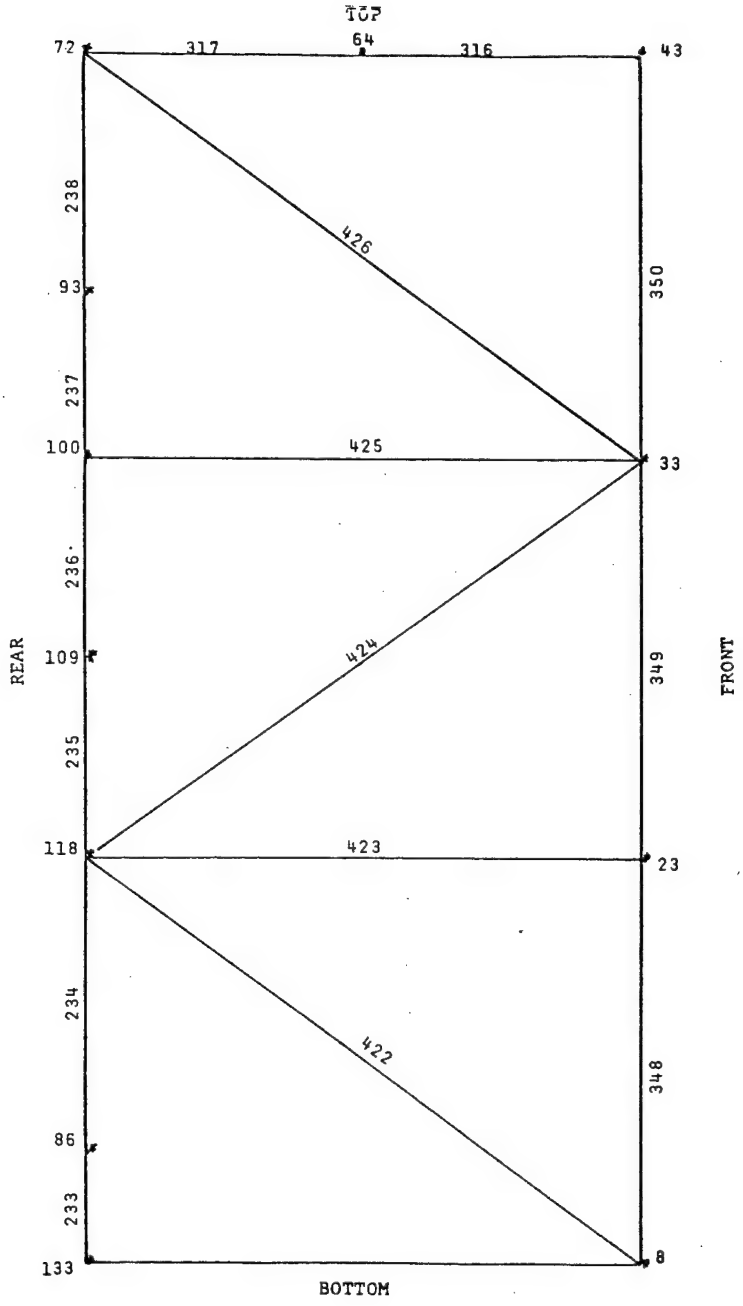
Intermediate Bracing Structure, LHS Bay 2,
Equipment Rack, Bar Elements and Grid Points



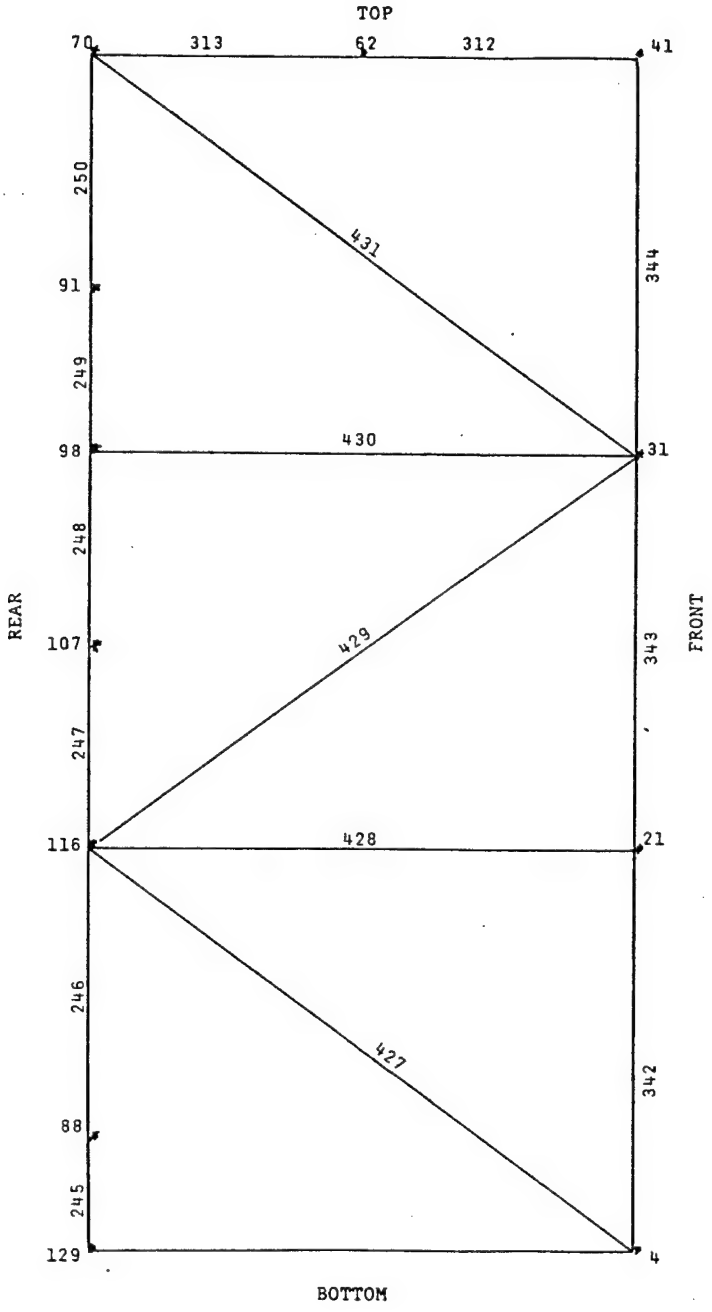
Intermediate Bracing Structure, RHS Bay 2,
Equipment Rack, Bar Elements and Grid Points



Intermediate Bracing Structure, LHS Bay 3,
Equipment Rack, Bar Elements and Grid Points



Intermediate Bracing Structure, RHS Bay 3,
Equipment Rack, Bar Elements and Grid Points



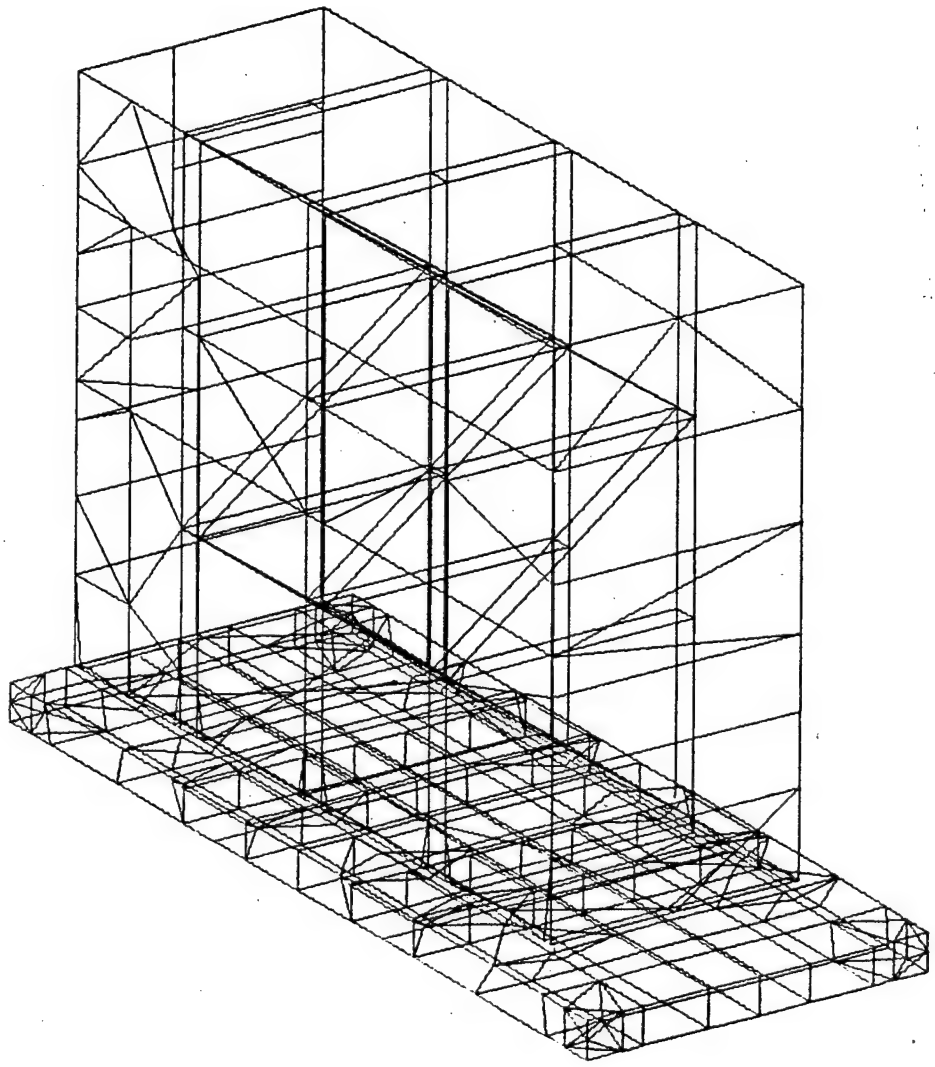
Intermediate Bracing Structure, RHS Bay 4,
Equipment Rack, Bar Elements and Grid Points

APPENDIX C

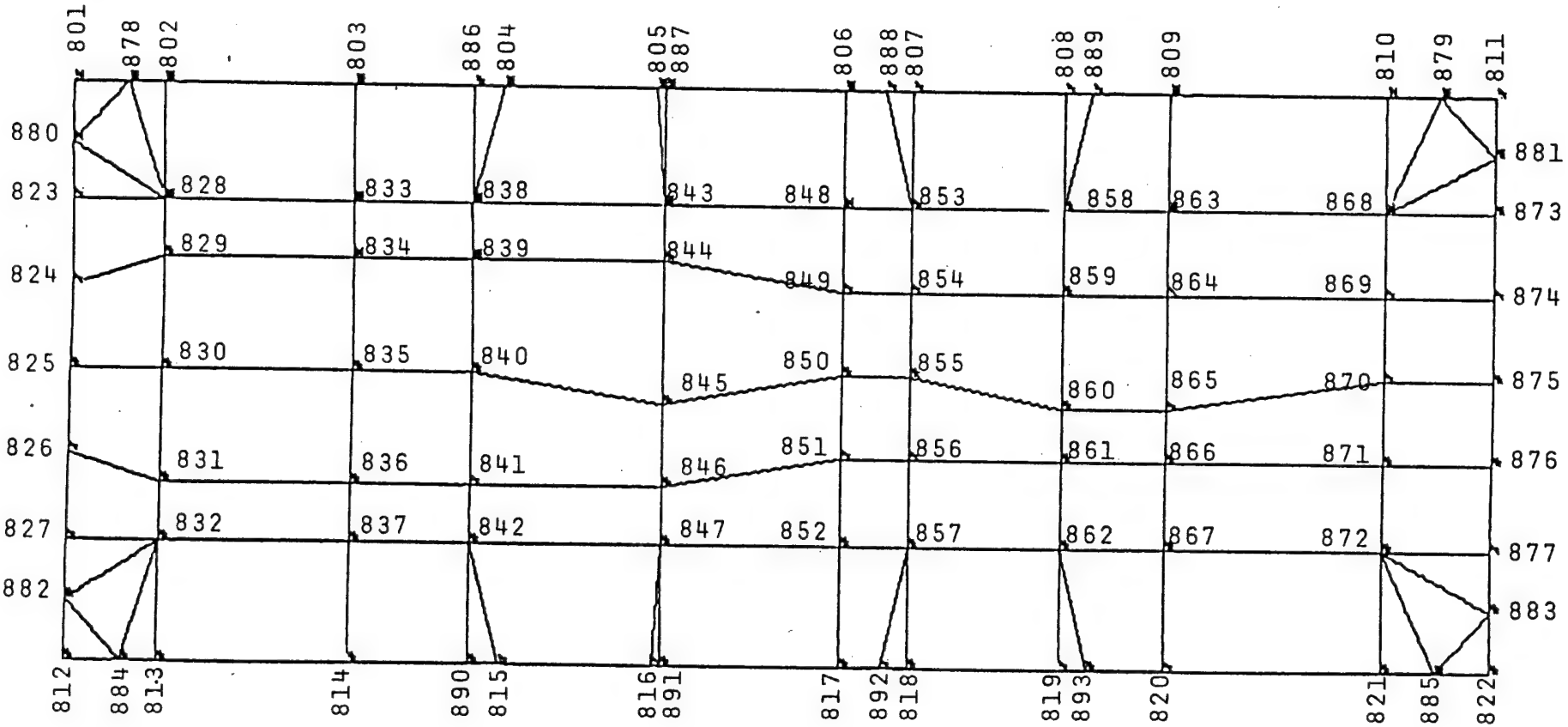
FINITE ELEMENT MODEL

RACK PALLET HALF

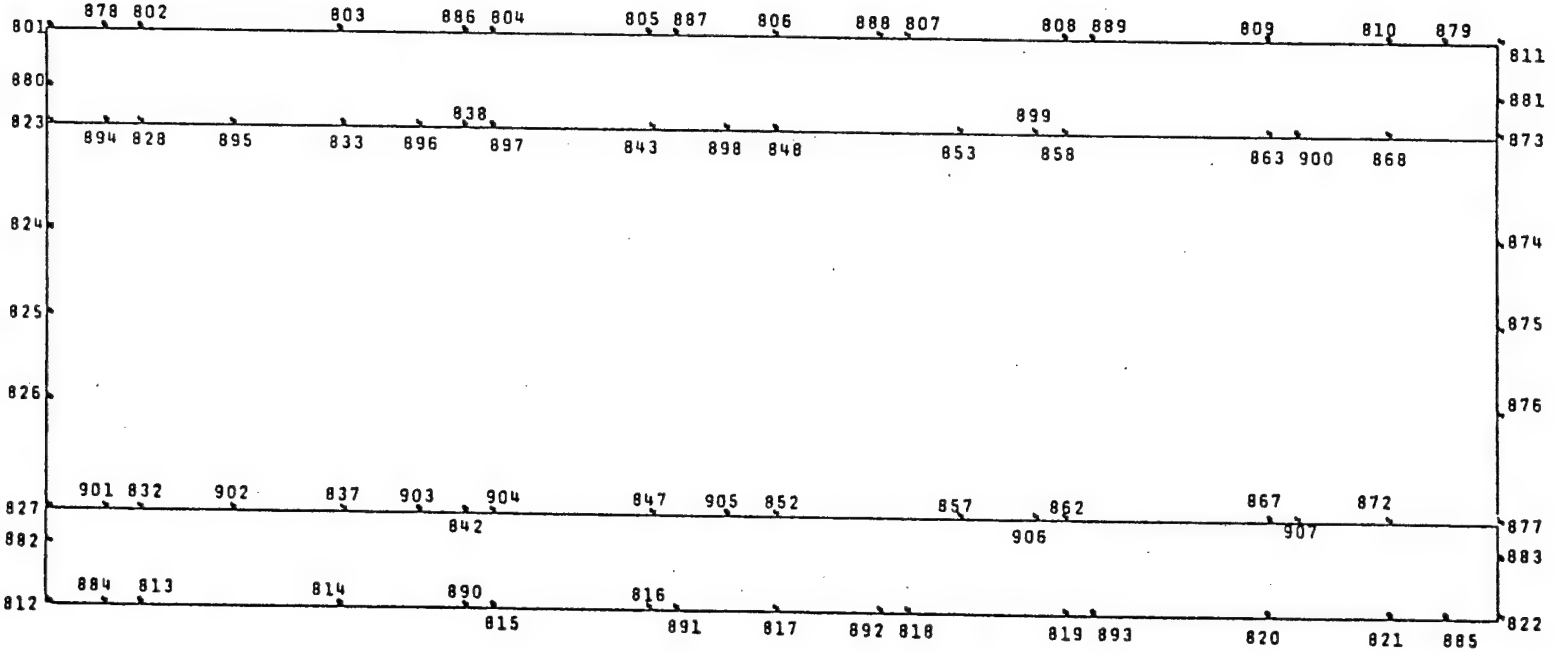
This appendix contains a plot of the equipment rack pallet, combined with the equipment rack. There are approximately 403 grid points, 546 bars, 441 plate elements, and over 2200 degrees of freedom in the model.



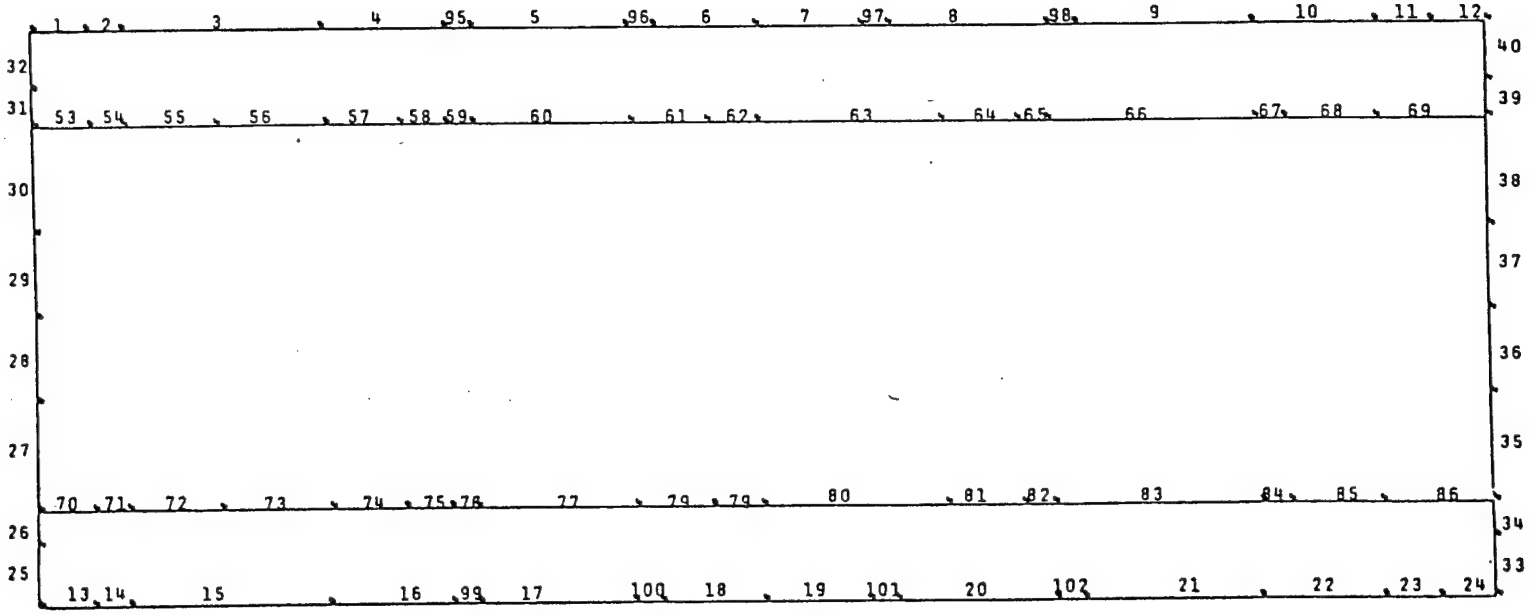
Rack Pallet Model



Top Plate, Rack Pallet, Nodes Only Shown

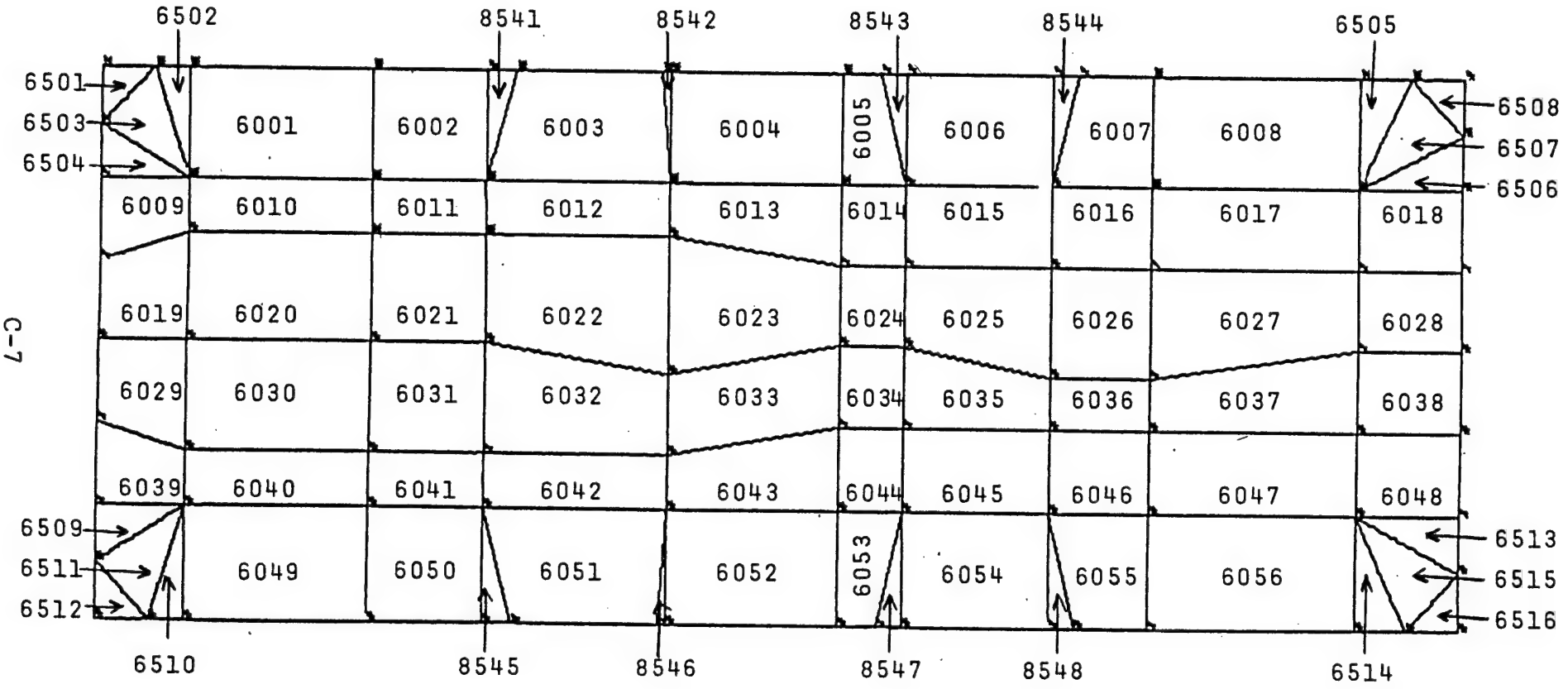


Top view, Rack Pallet, Node points pertaining to bar elements

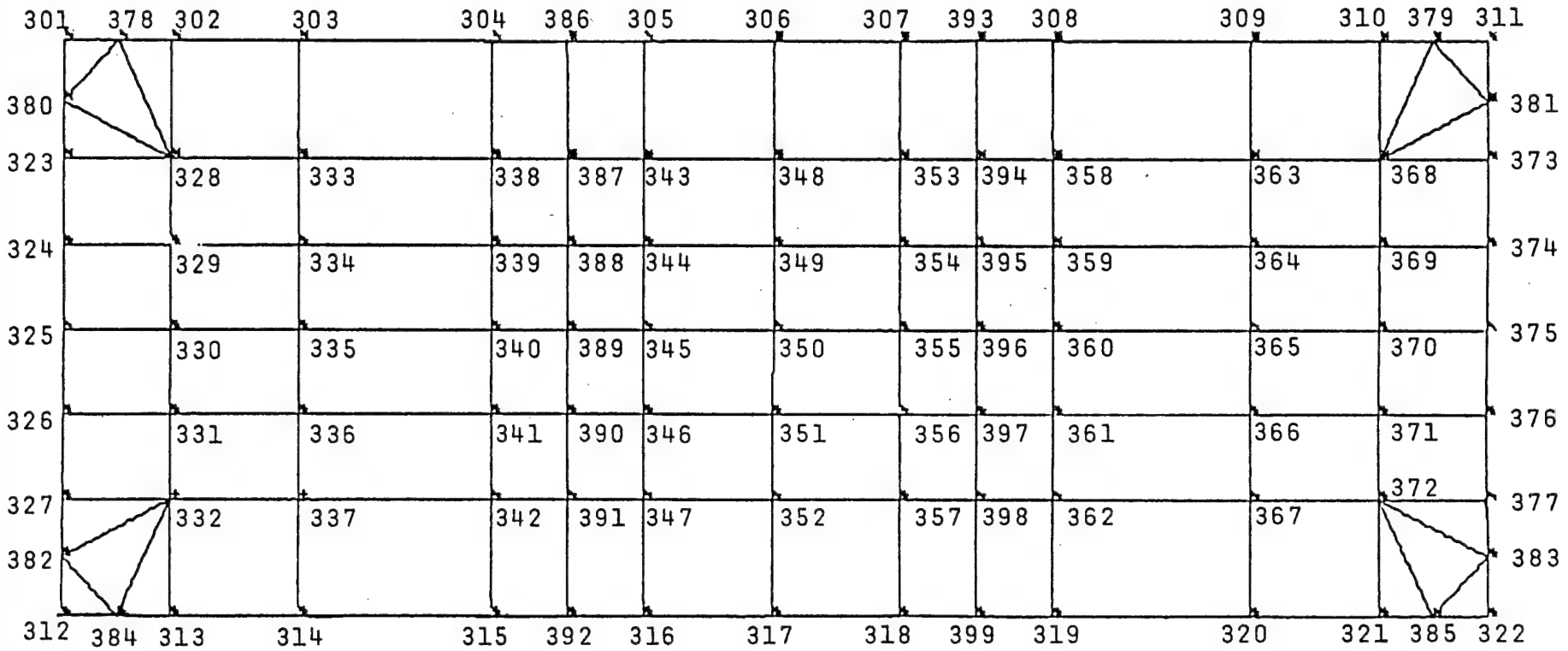


Note: Add 4000 to all Bar Element ID's

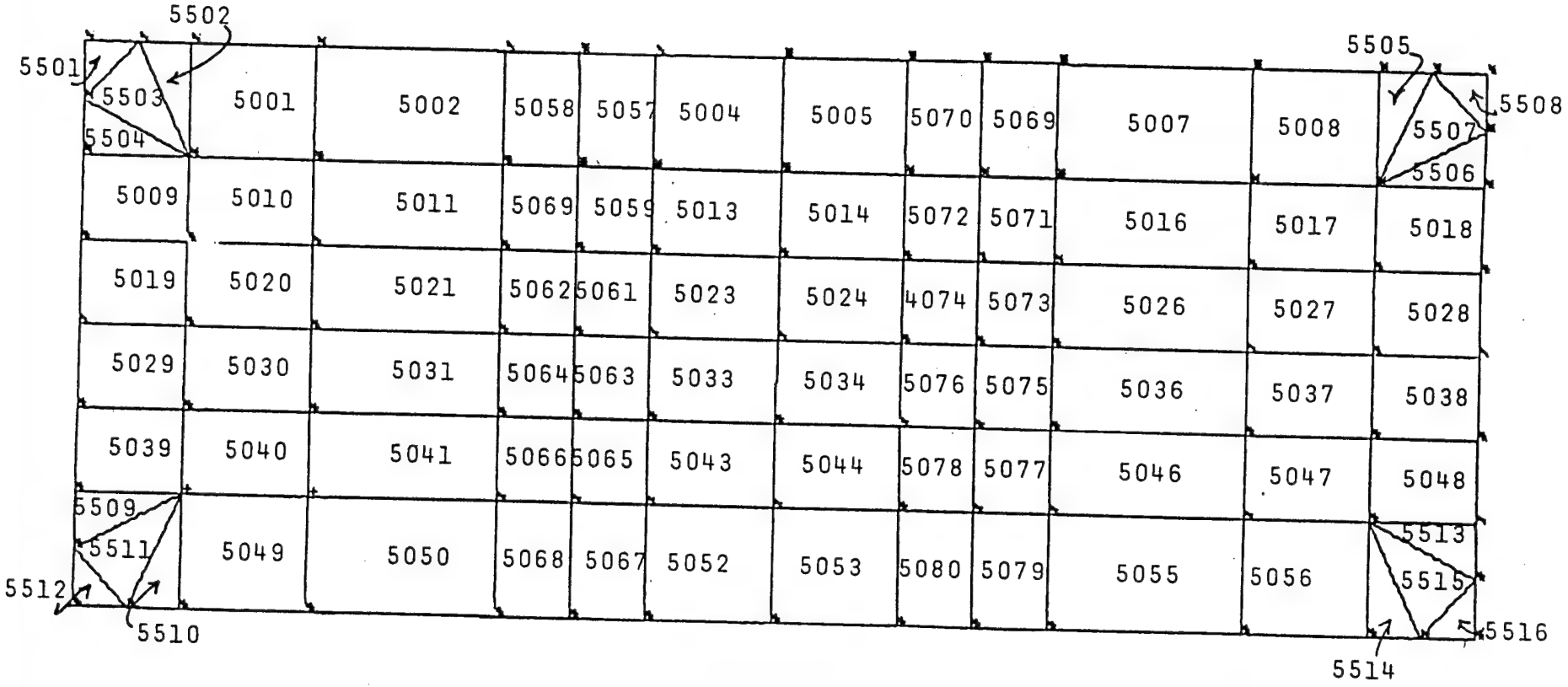
Top view, Rack Pallet, Bar elements only shown



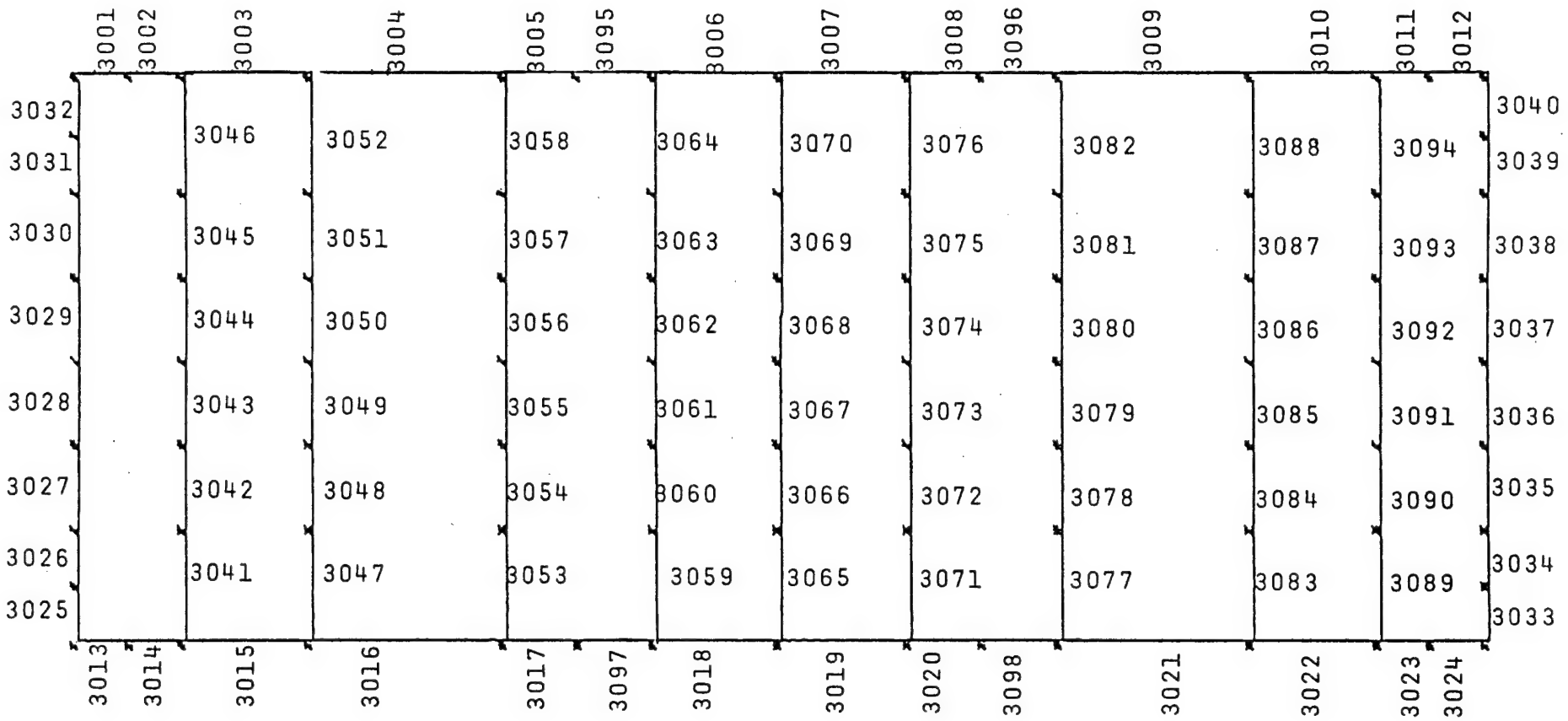
Top Plate, Rack Pallet, Plate Elements Only Shown



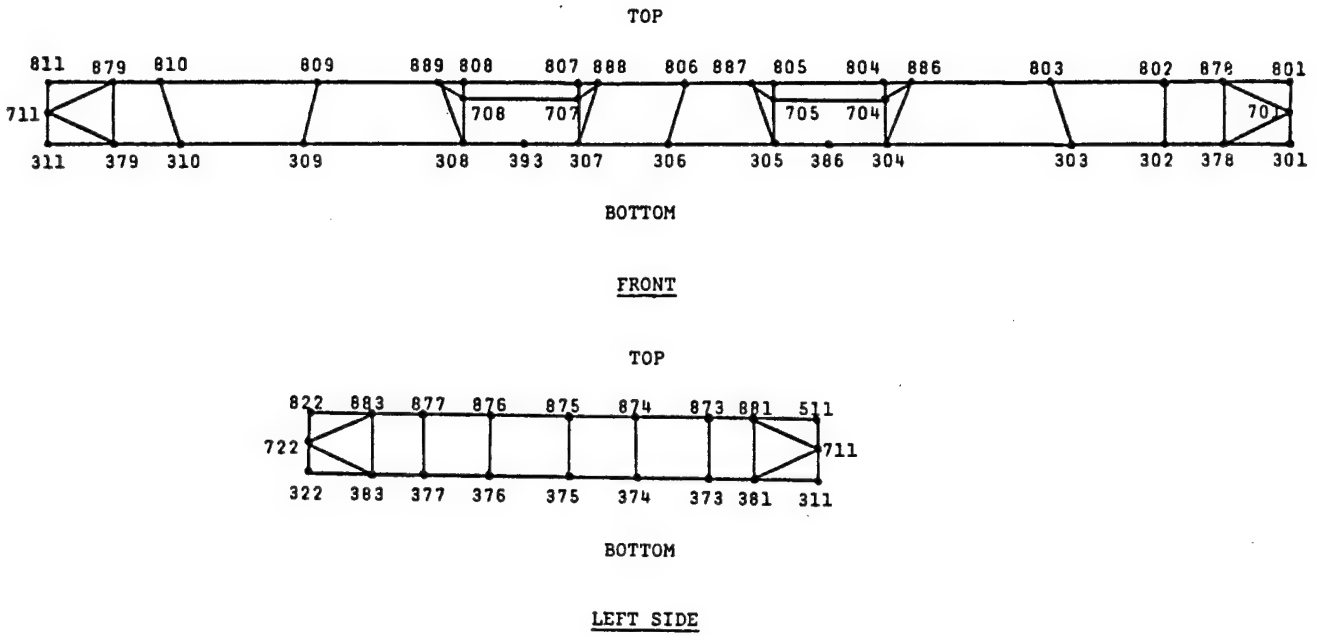
Bottom Plate, Rack Pallet. Nodes Only Shown.



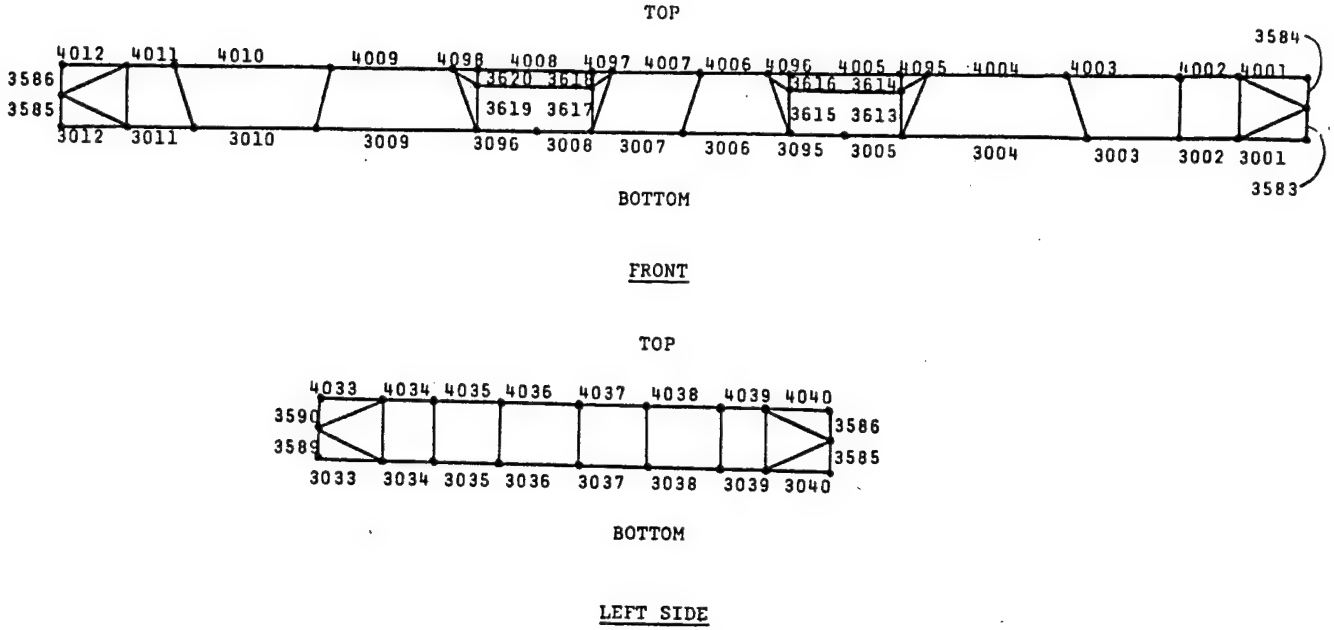
Bottom Plate, Rack Pallet. Plate Elements Only Shown.



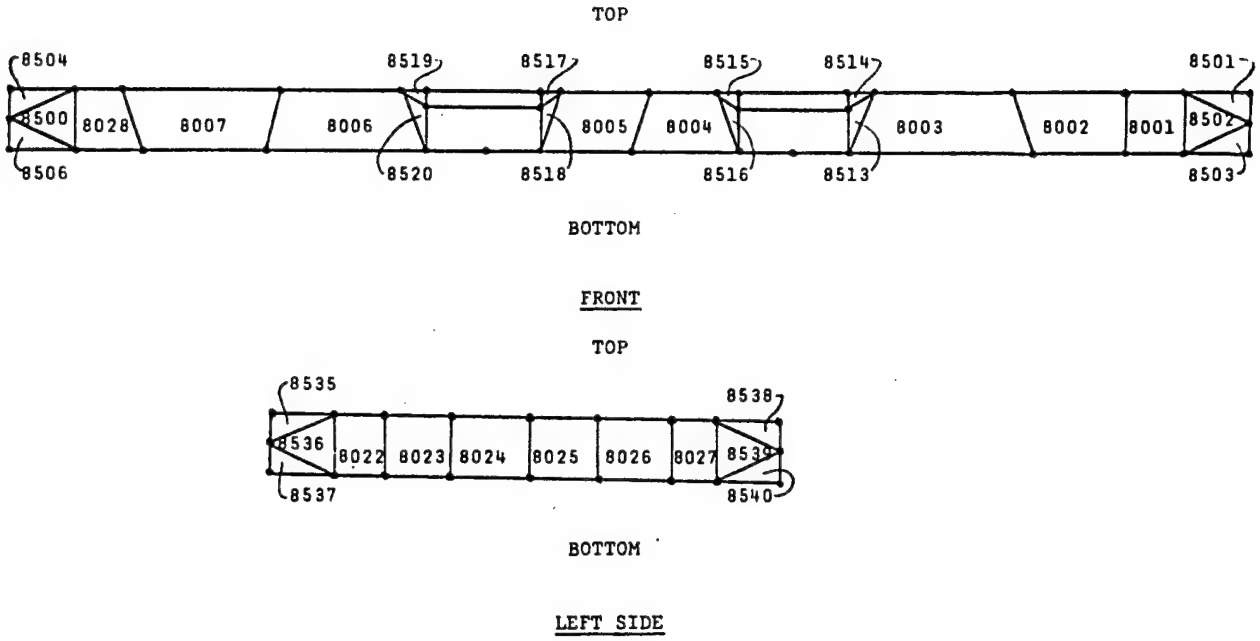
Bottom Surface, Rack Pallet. Bar Elements Only Shown.



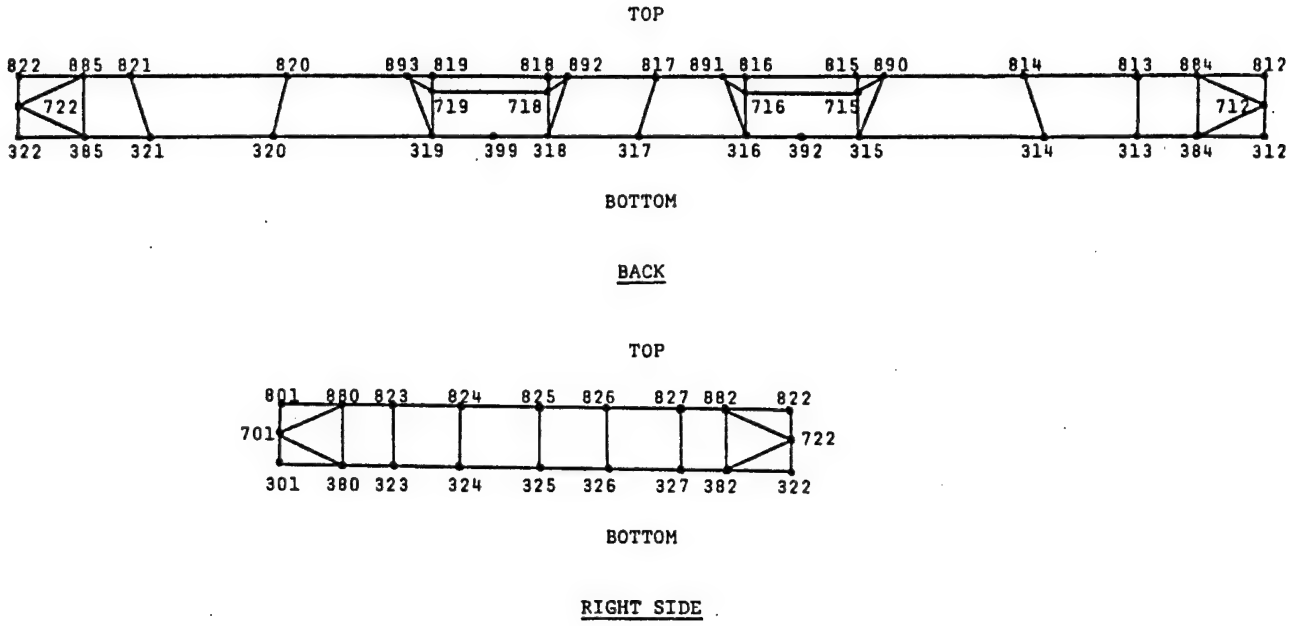
Front and Left Side View of Rack Pallet Structure. Node Points Only Shown.



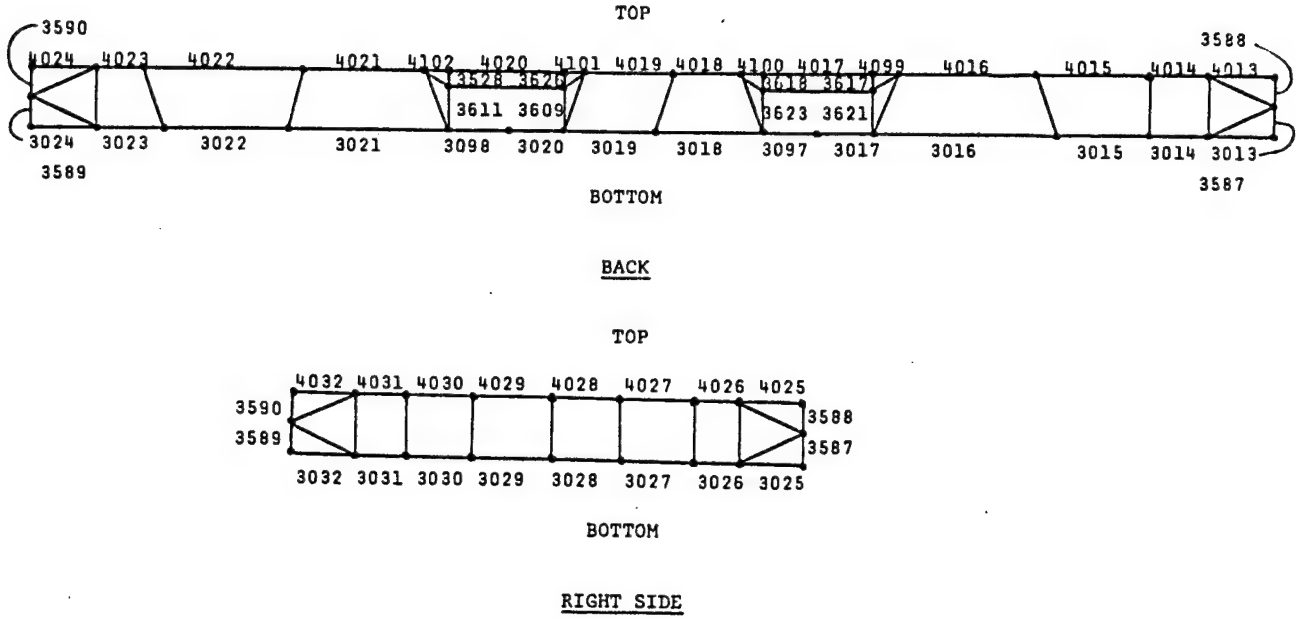
Front and Left Side View of Rack Pallet Structure. Bar Elements Only Shown.



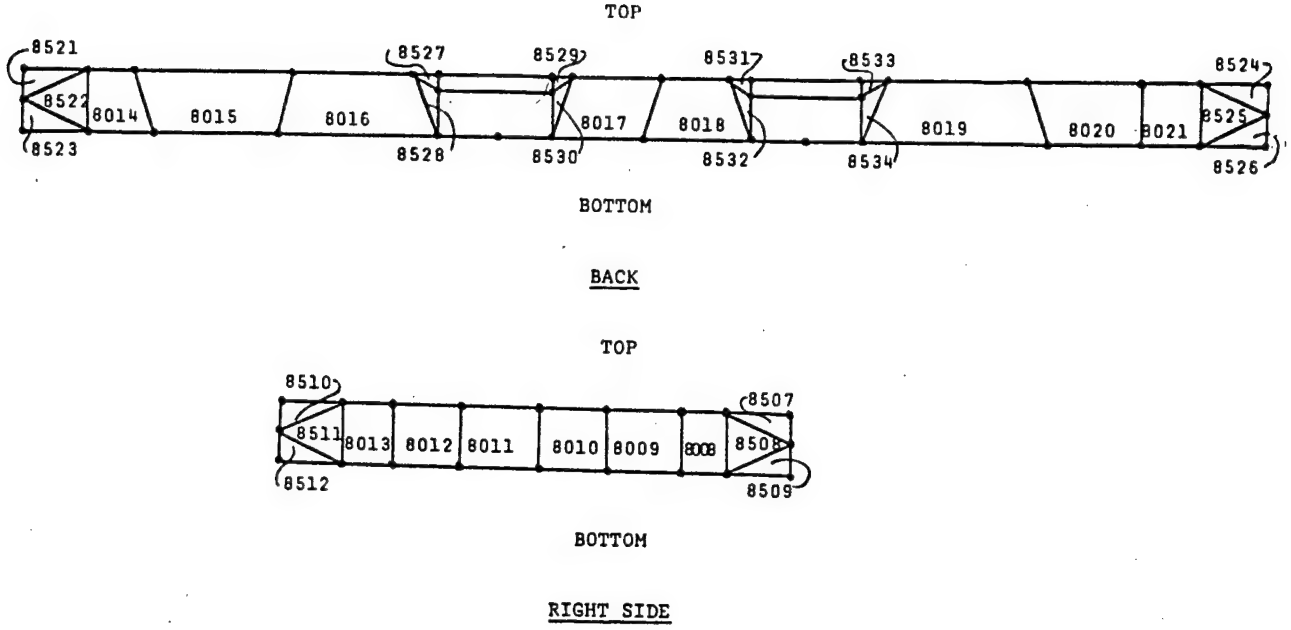
Front and Left Side View of Rack Pallet Structure. Plate Elements Only Shown.



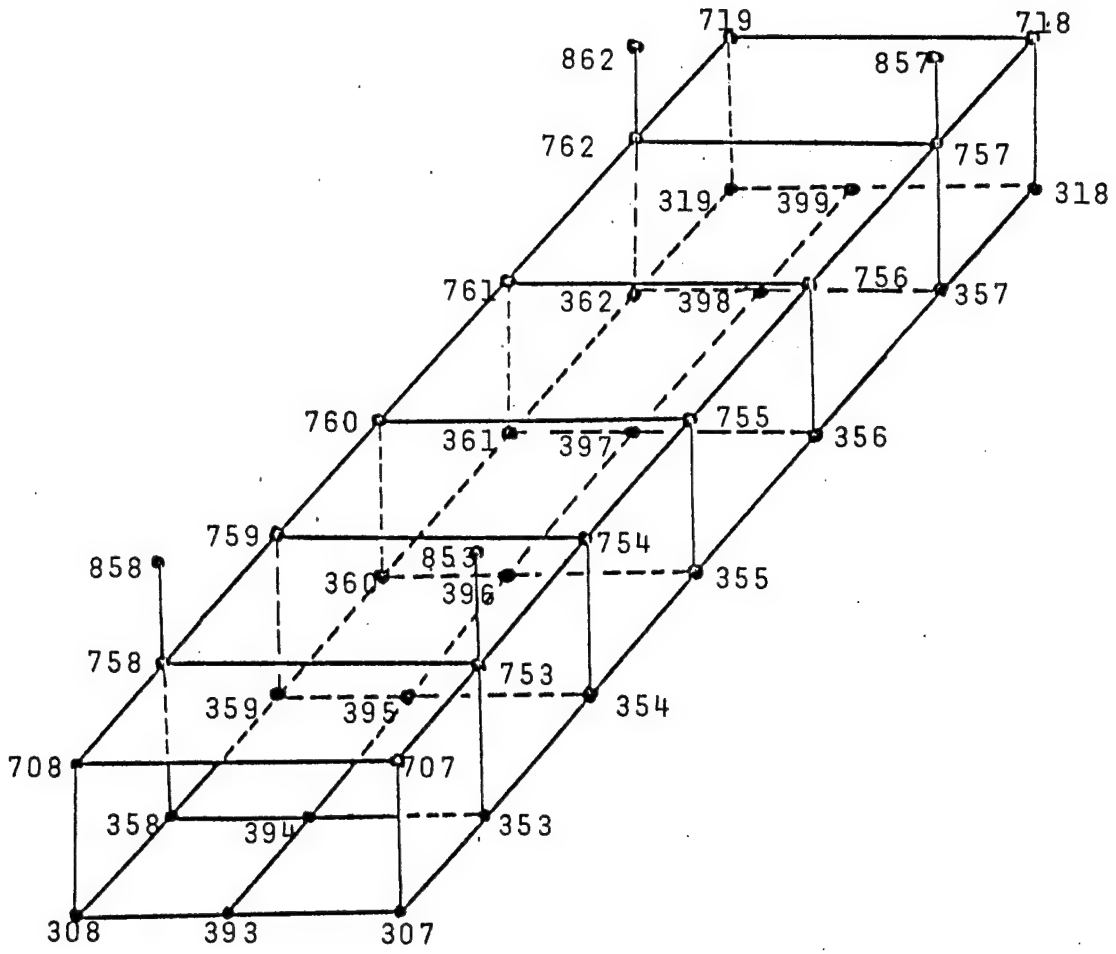
Back and Right Side View of Rack Pallet Structure. Node Points Only Shown.



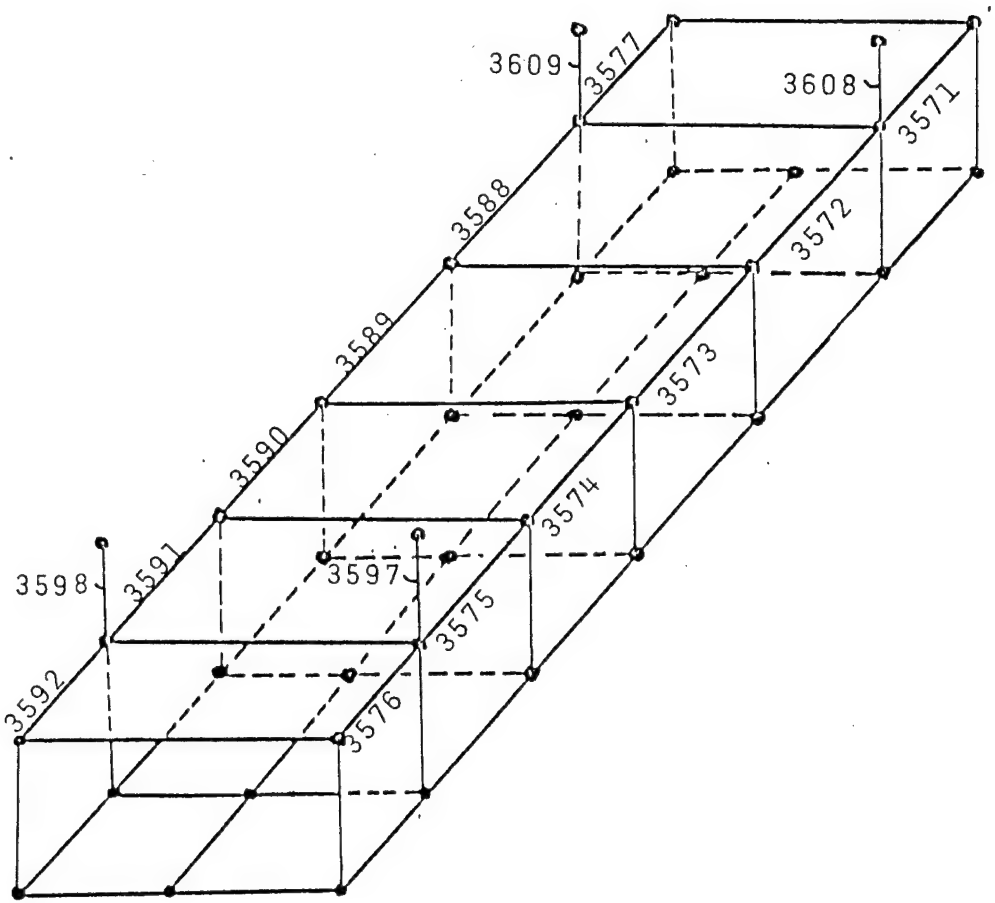
Back and Right Side View of Rack Pallet Structure. Bar Elements Only Shown.



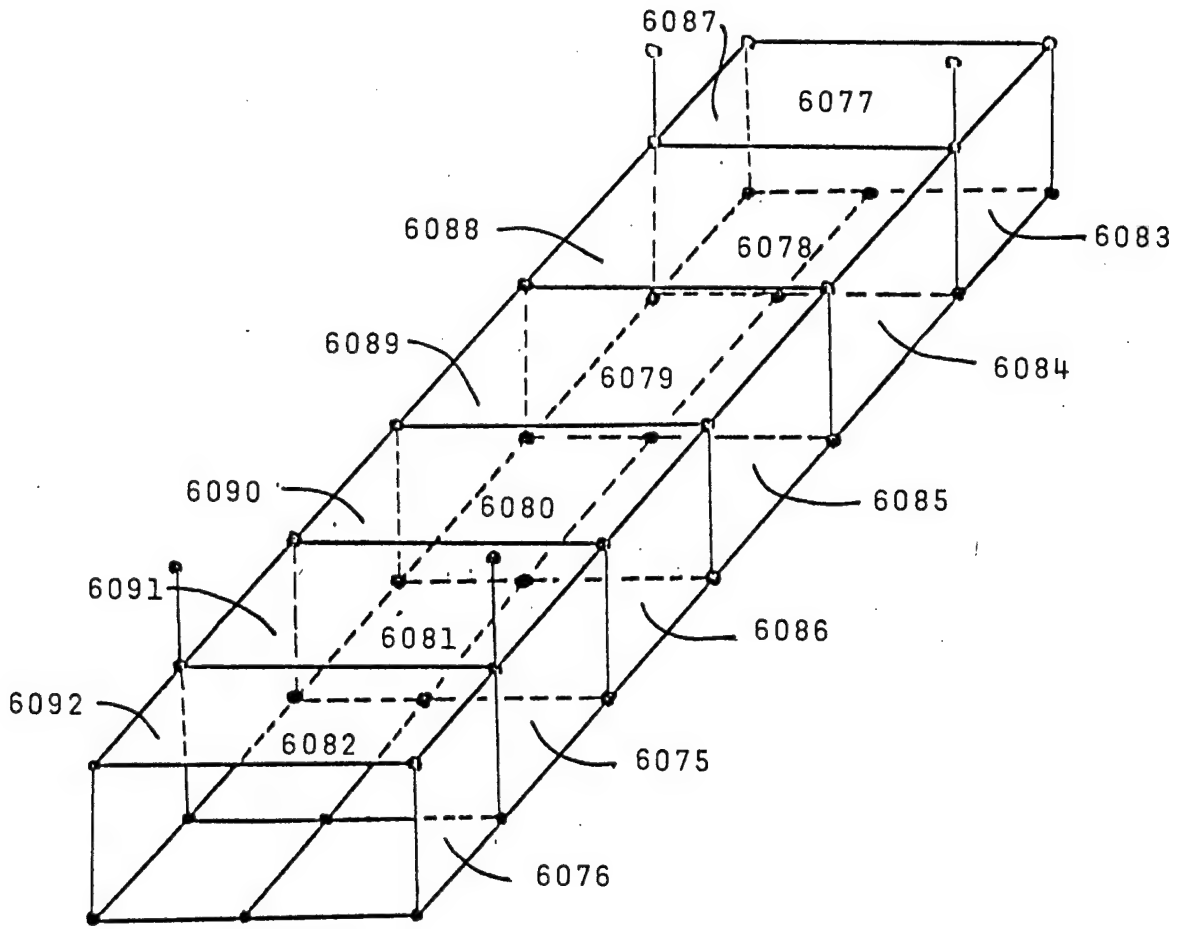
Back and Right Side View of Rack Pallet Structure. Plate Elements Only Shown.



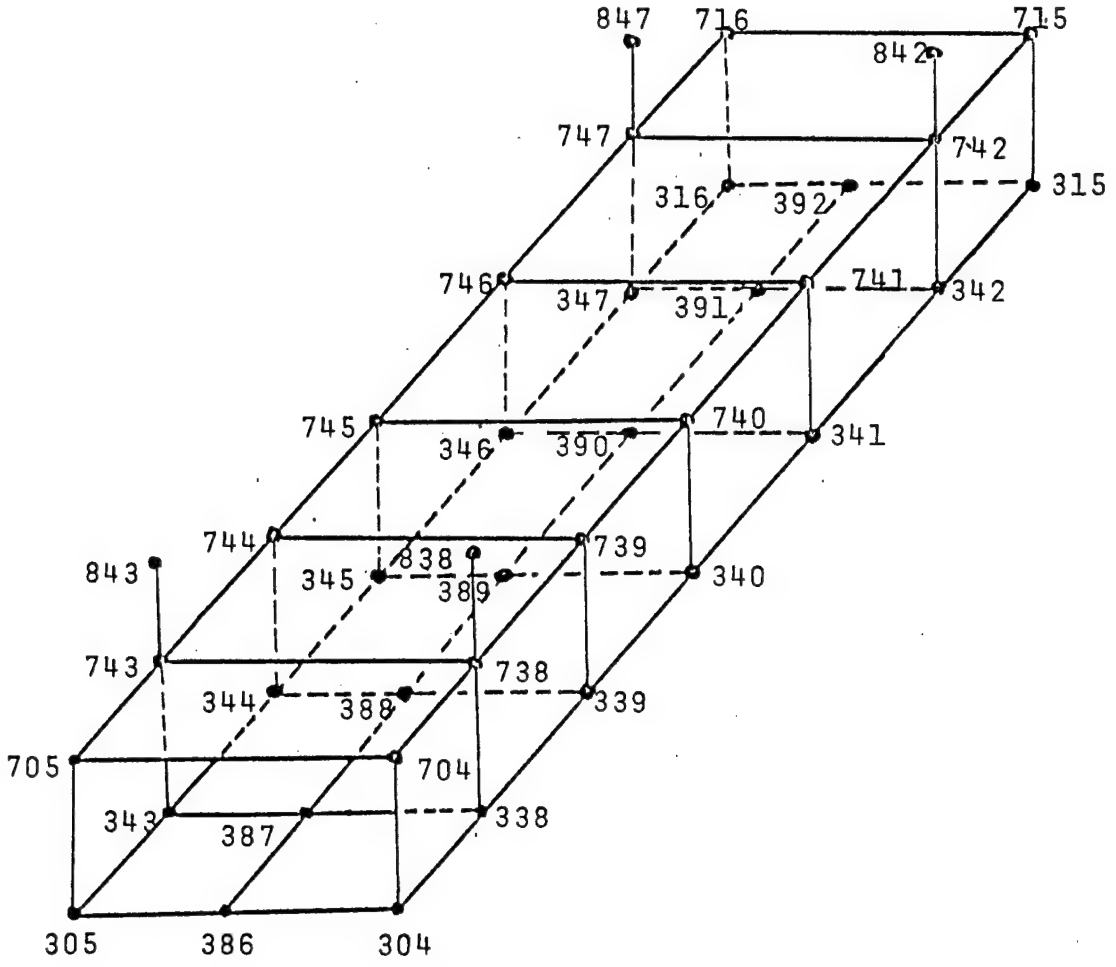
Left Tunnel, Rack Pallet. Node Points Only Shown.



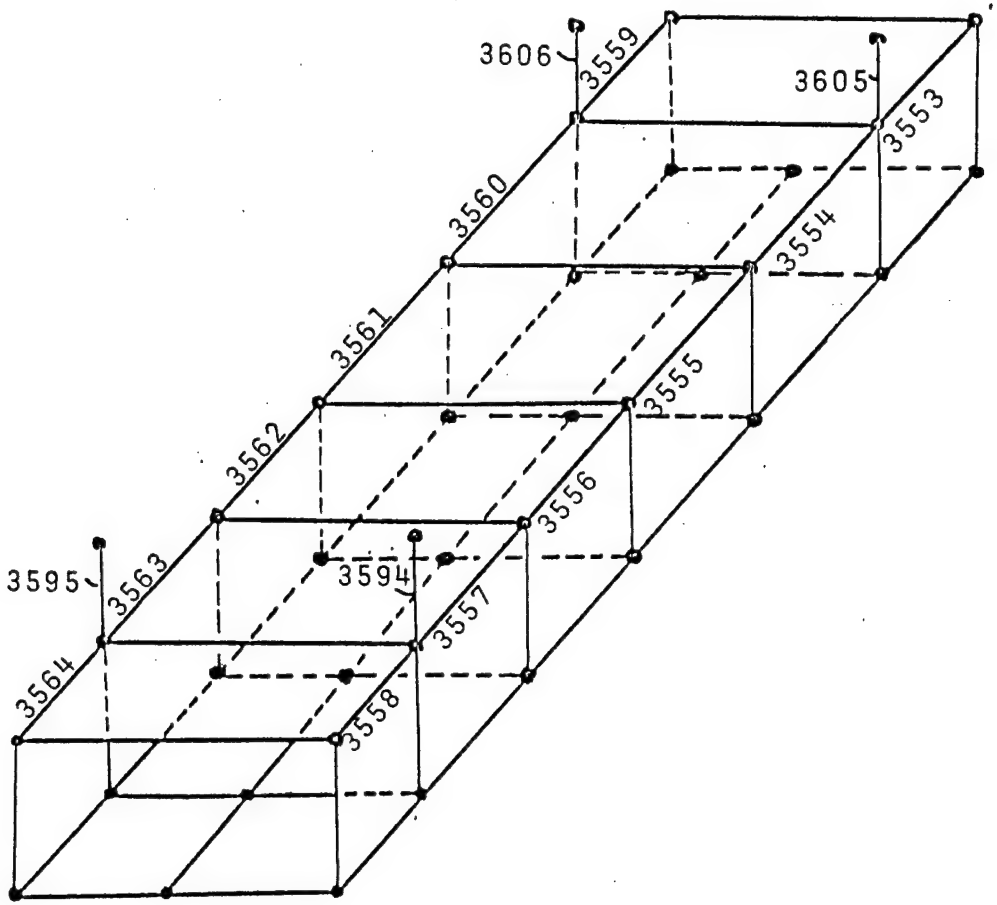
Left Tunnel, Rack Pallet. Bar Elements Only Shown.



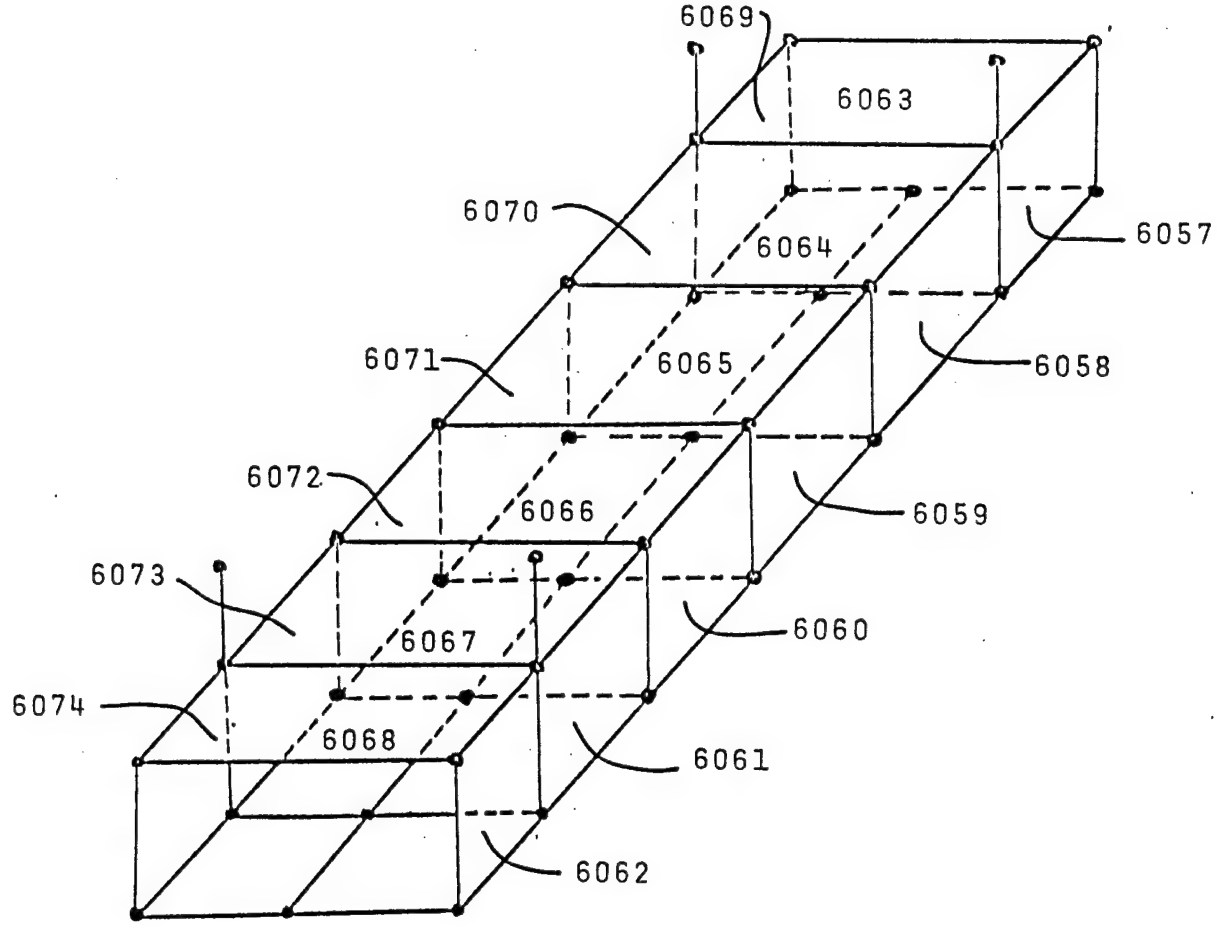
Left Tunnel, Rack Pallet. Plate Elements Only Shown.



Right Tunnel, Rack Pallet. Node Points Only Shown.



Right Tunnel, Rack Pallet. Bar Elements Only Shown.



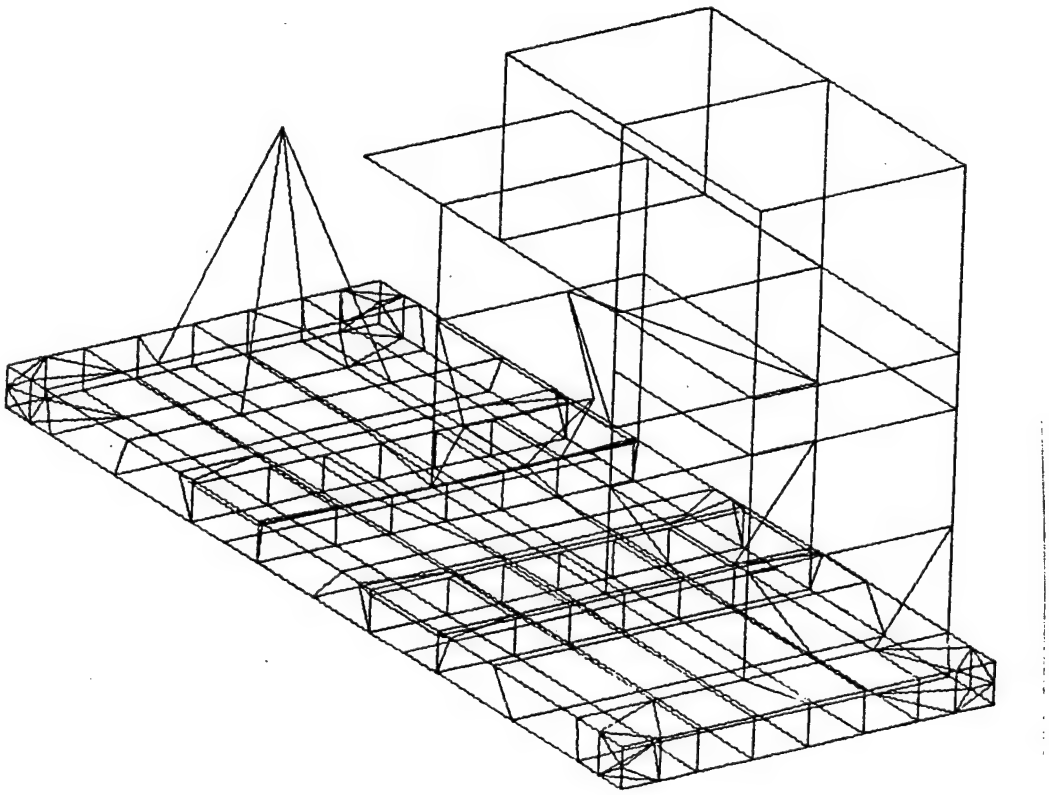
Right Tunnel, Rack Pallet. Plate Elements Only Shown.

APPENDIX D

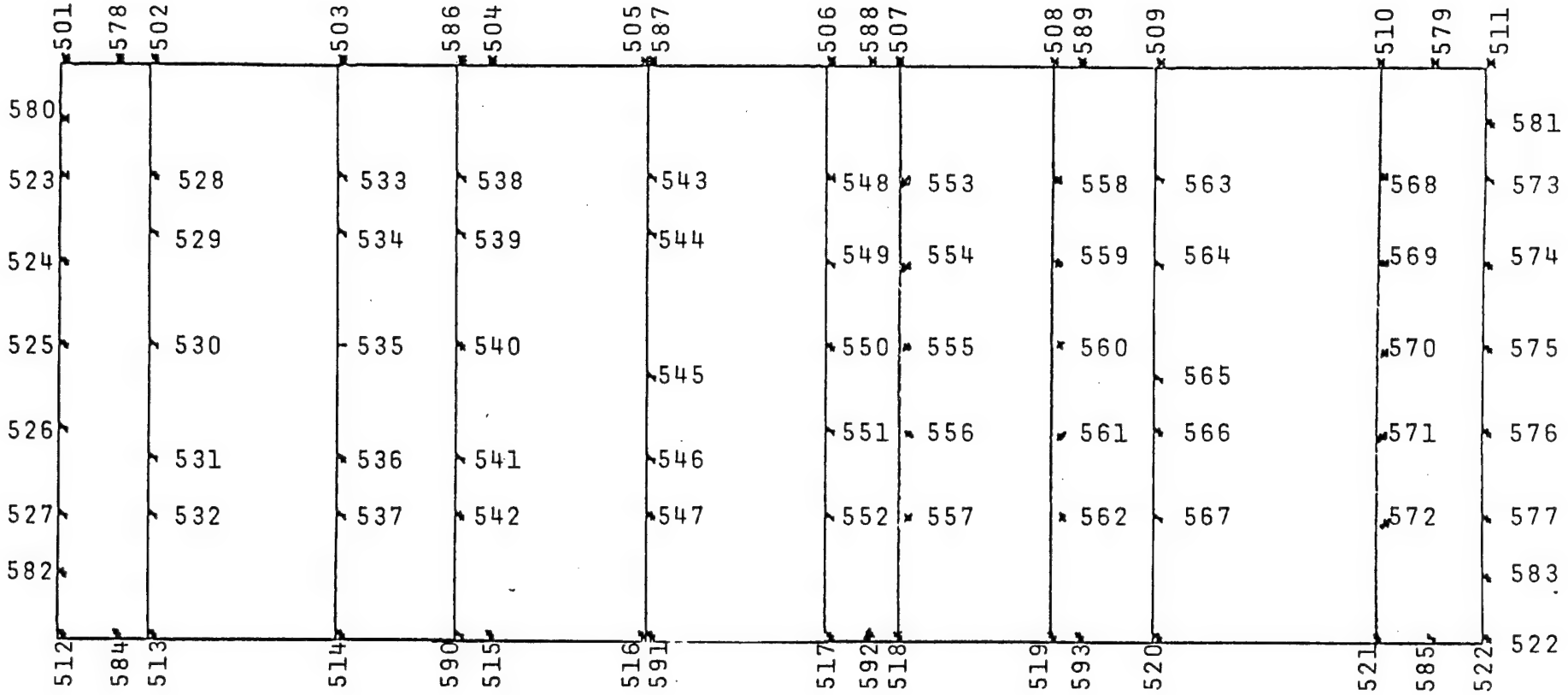
FINITE ELEMENT MODEL

SEAT PALLET HALF

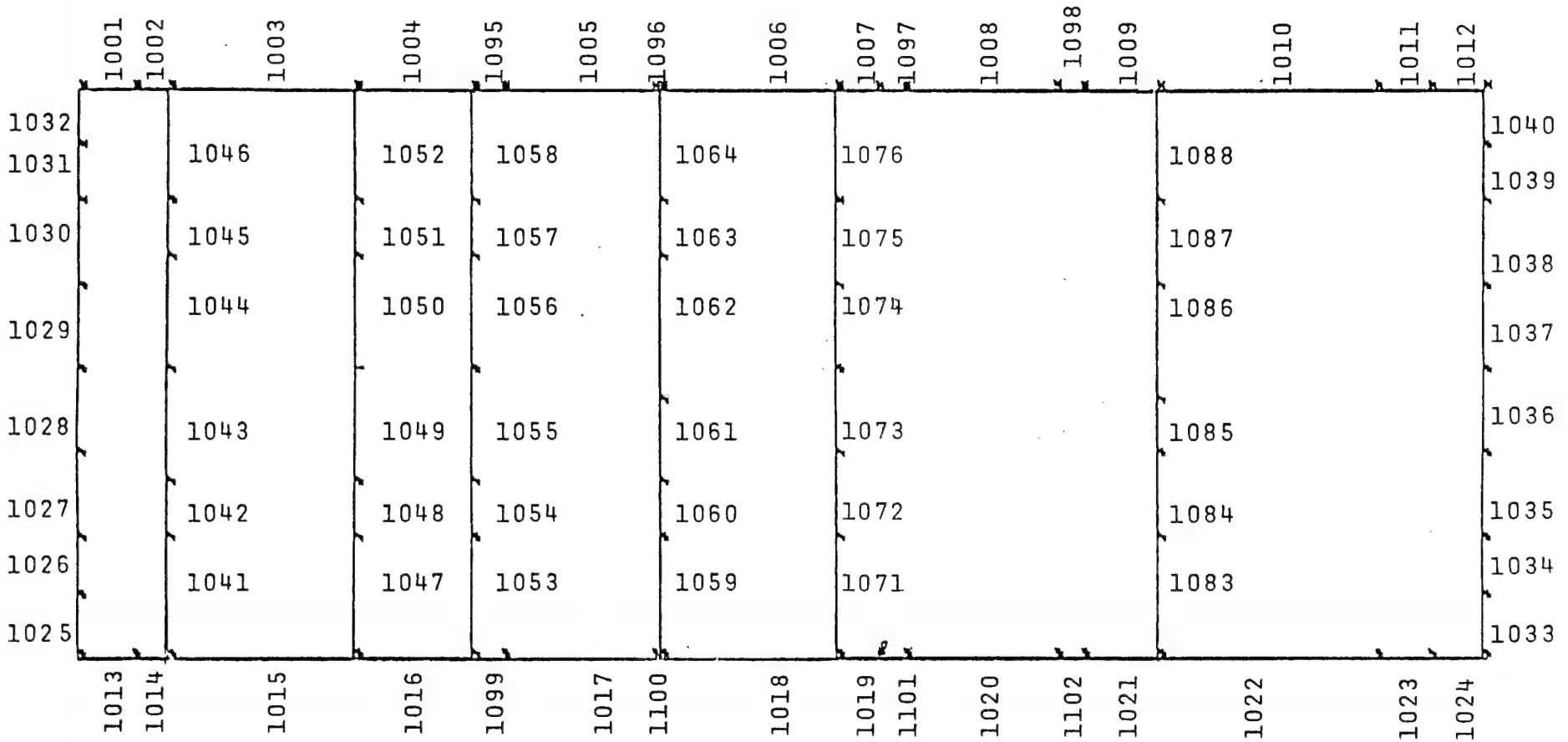
In this appendix, the plots associated with the seat pallet model are included. The model contains 236 grid points, 245 bars, and 267 plate elements.



Seat Pallet Model

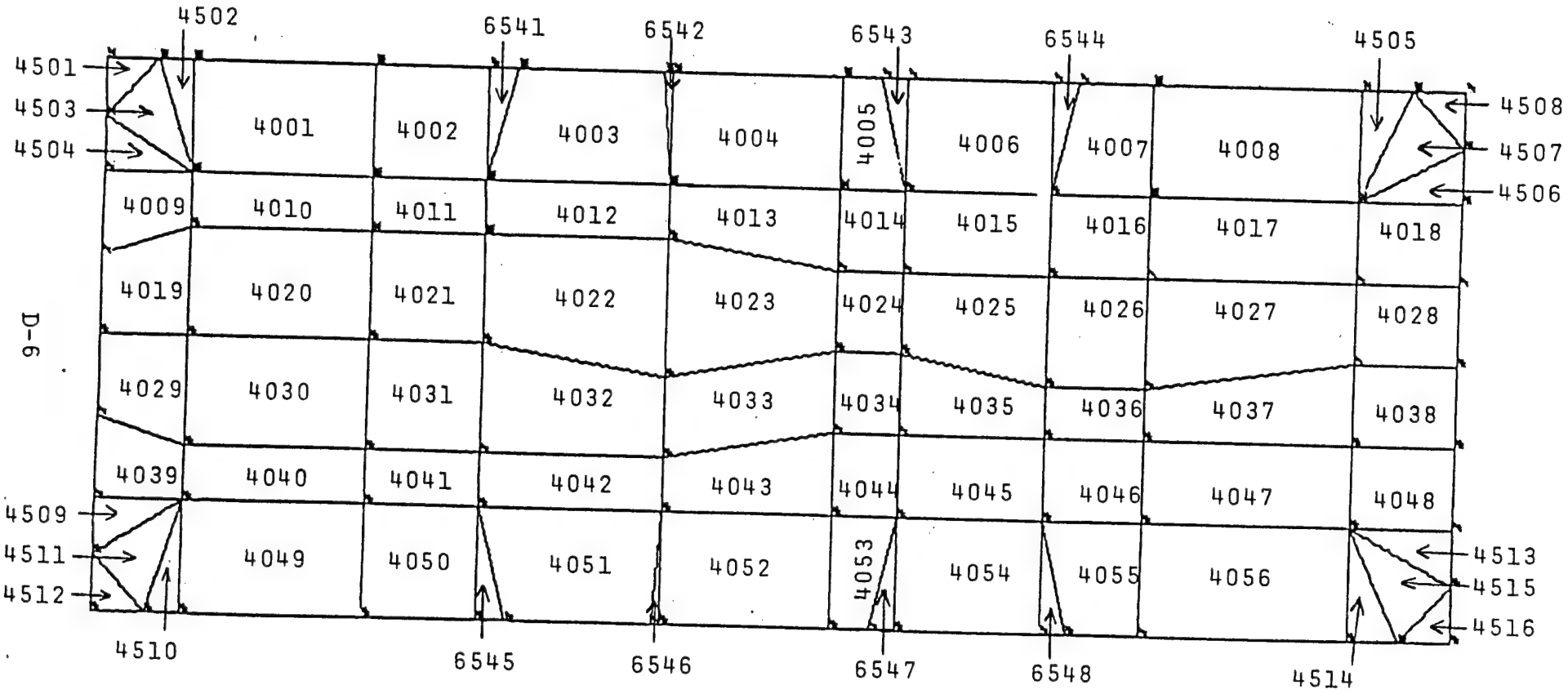


Top Plate, Seat Pallet, Nodes Only Shown



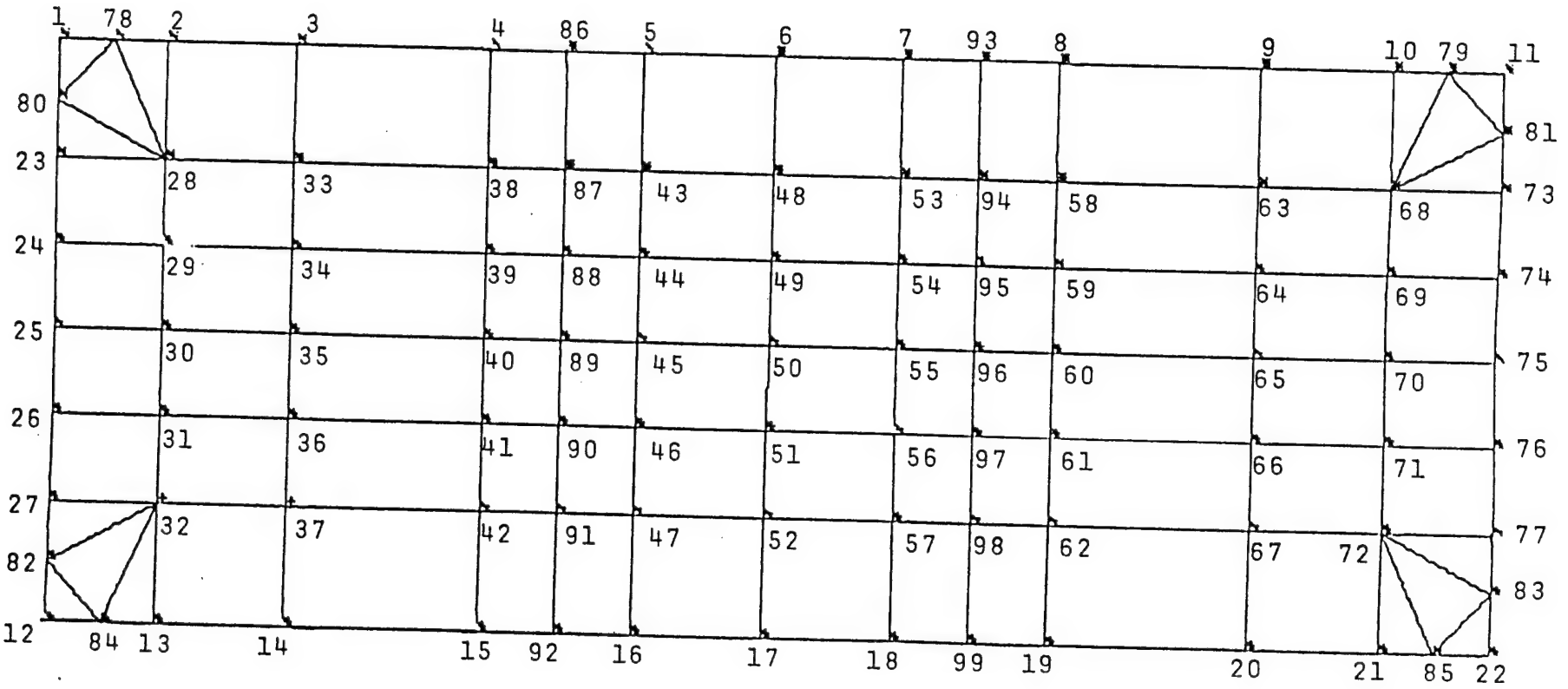
Note: Add 1000 to bar element I.D. numbers

Top Plate, Seat Pallet, Bar Elements Only Shown

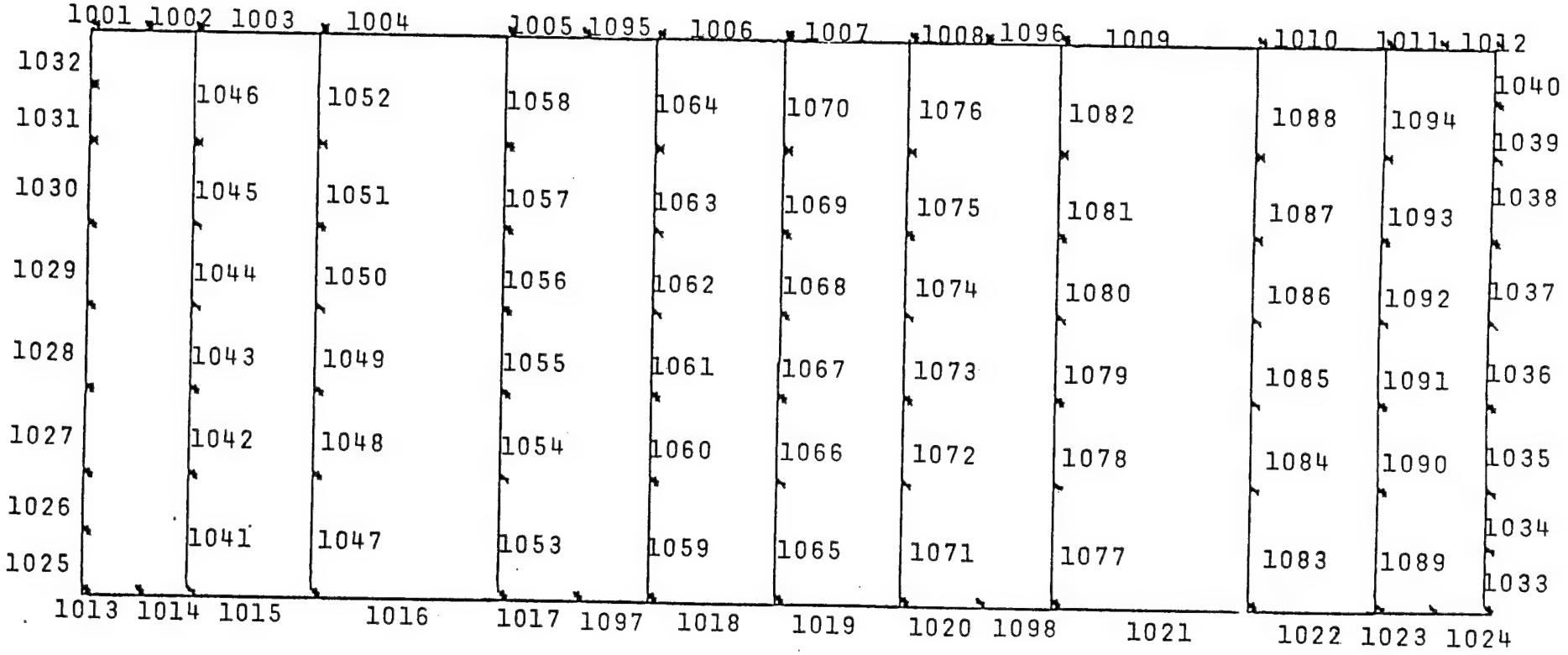


D-6

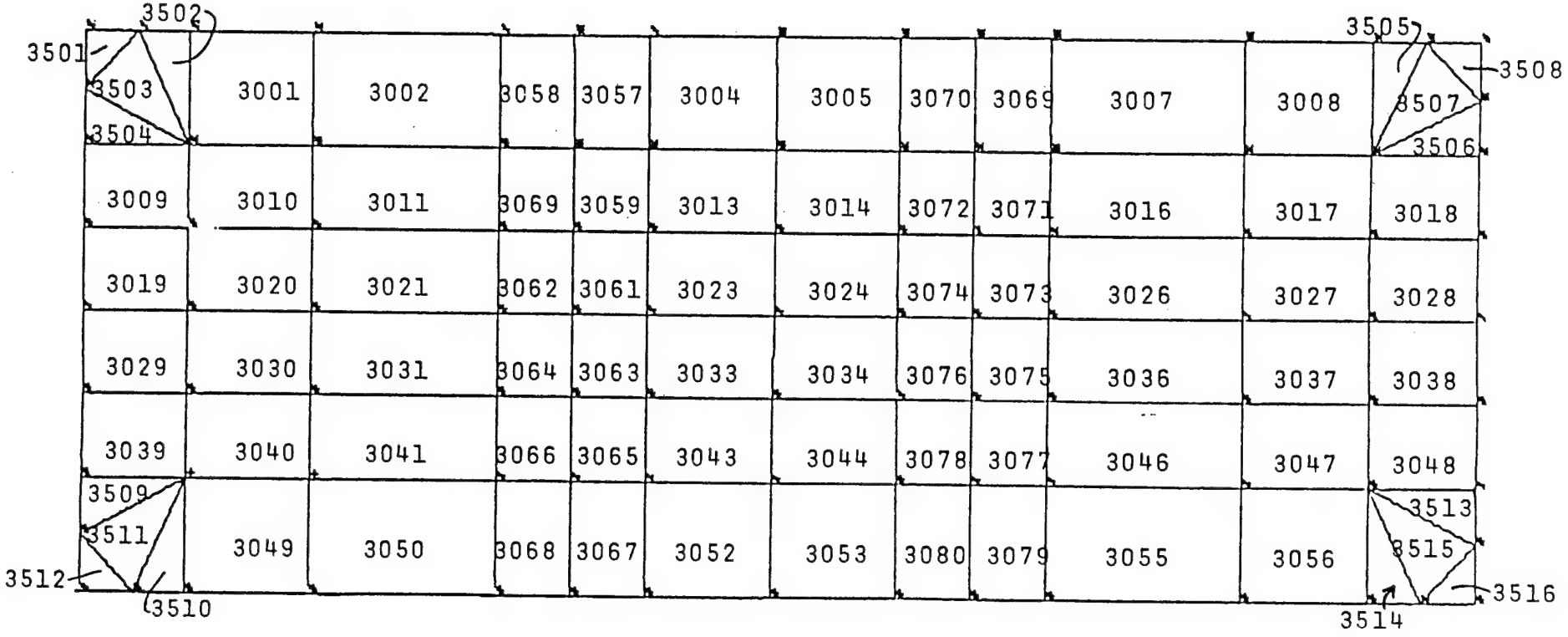
Top Plate, Seat Pallet, Plate Elements Only Shown



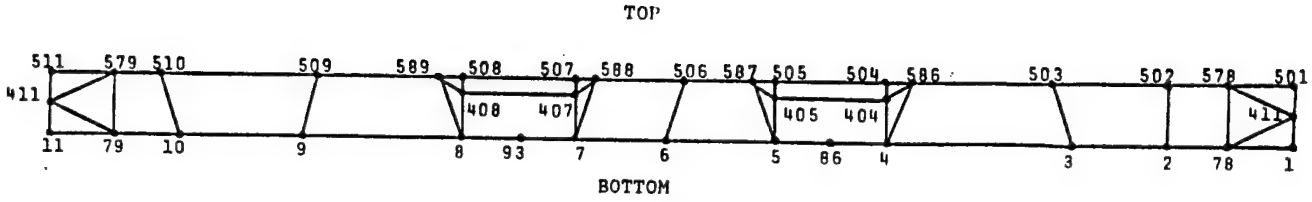
Bottom Plate, Seat Pallet, Nodes Only Shown.



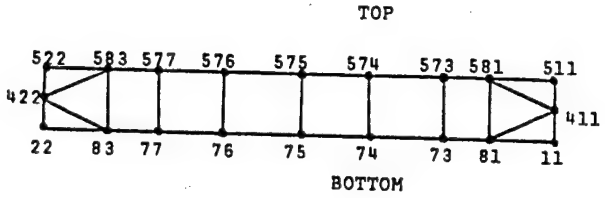
Bottom Surface, Seat Pallet. Bar Elements Only Shown.



Bottom Plate, Seat Pallet. Plate Elements Only Shown.

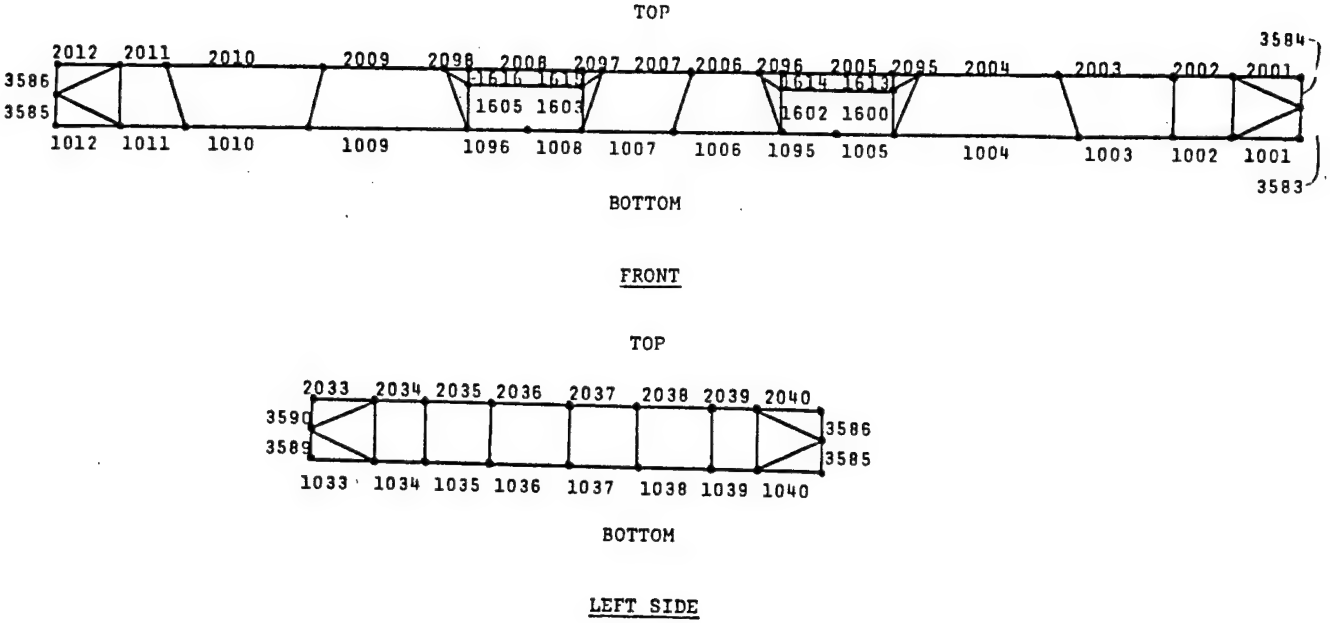


FRONT

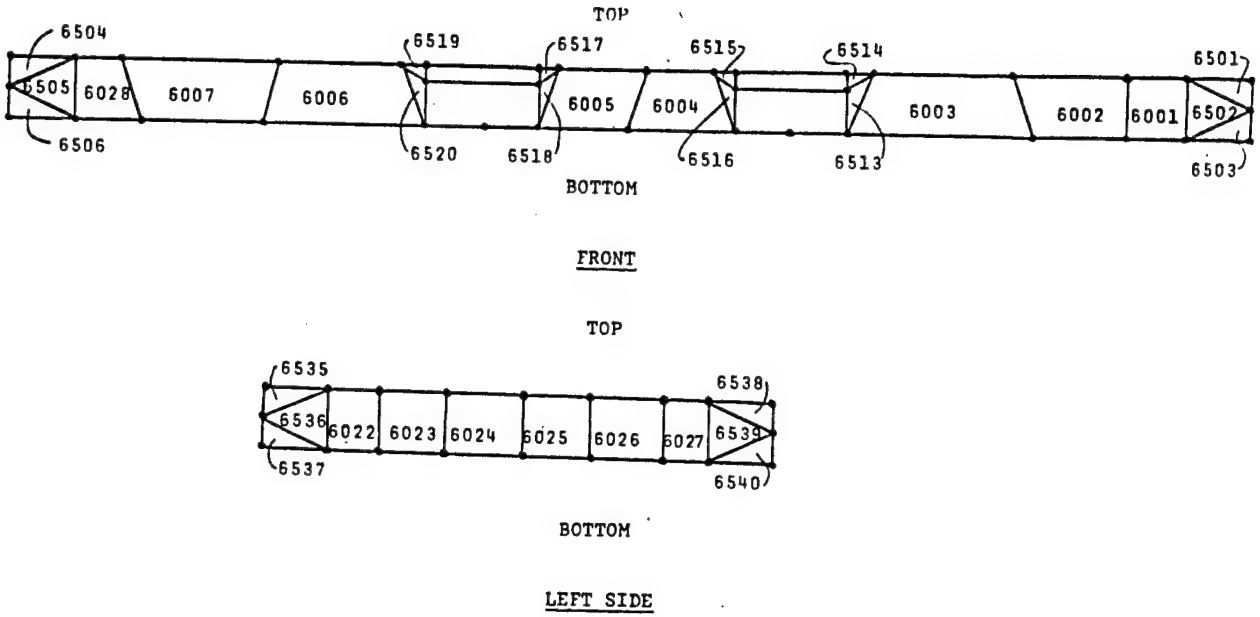


LEFT SIDE

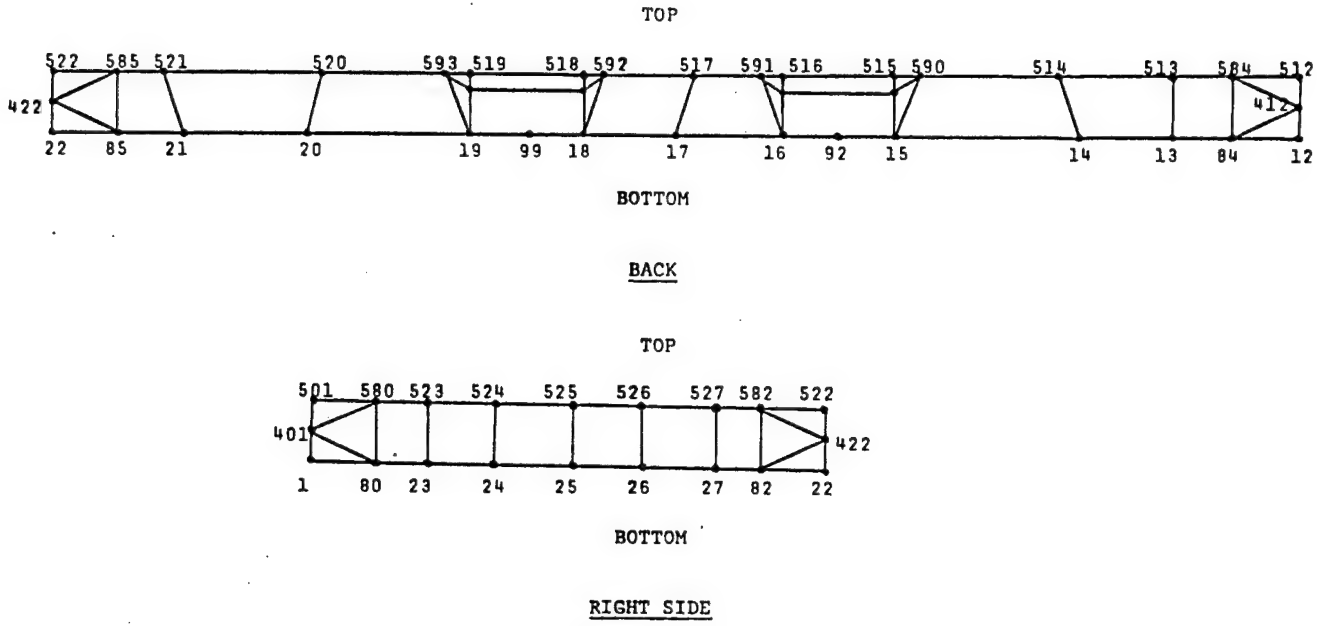
Front and Left Side View of Seat Pallet Structure. Node Points Only Shown.



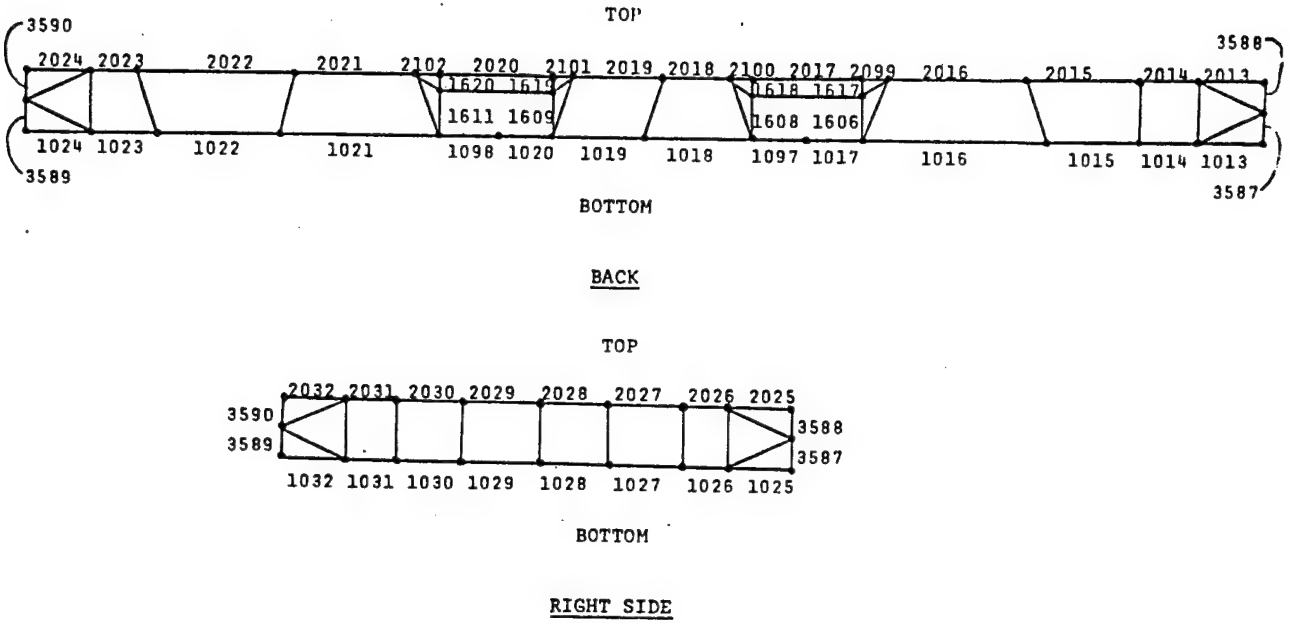
Front and Left Side View of Seat Pallet Structure. Bar Elements Only Shown.



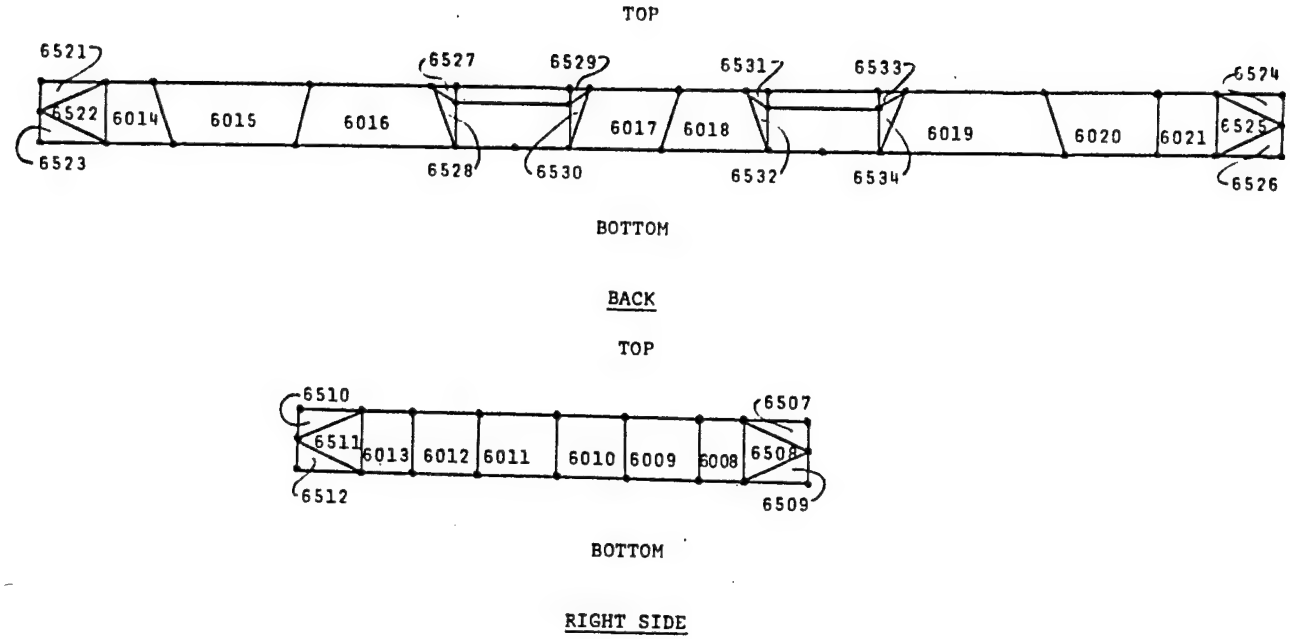
Front and Left Side View of Seat Pallet Structure. Plate Elements Only Shown.



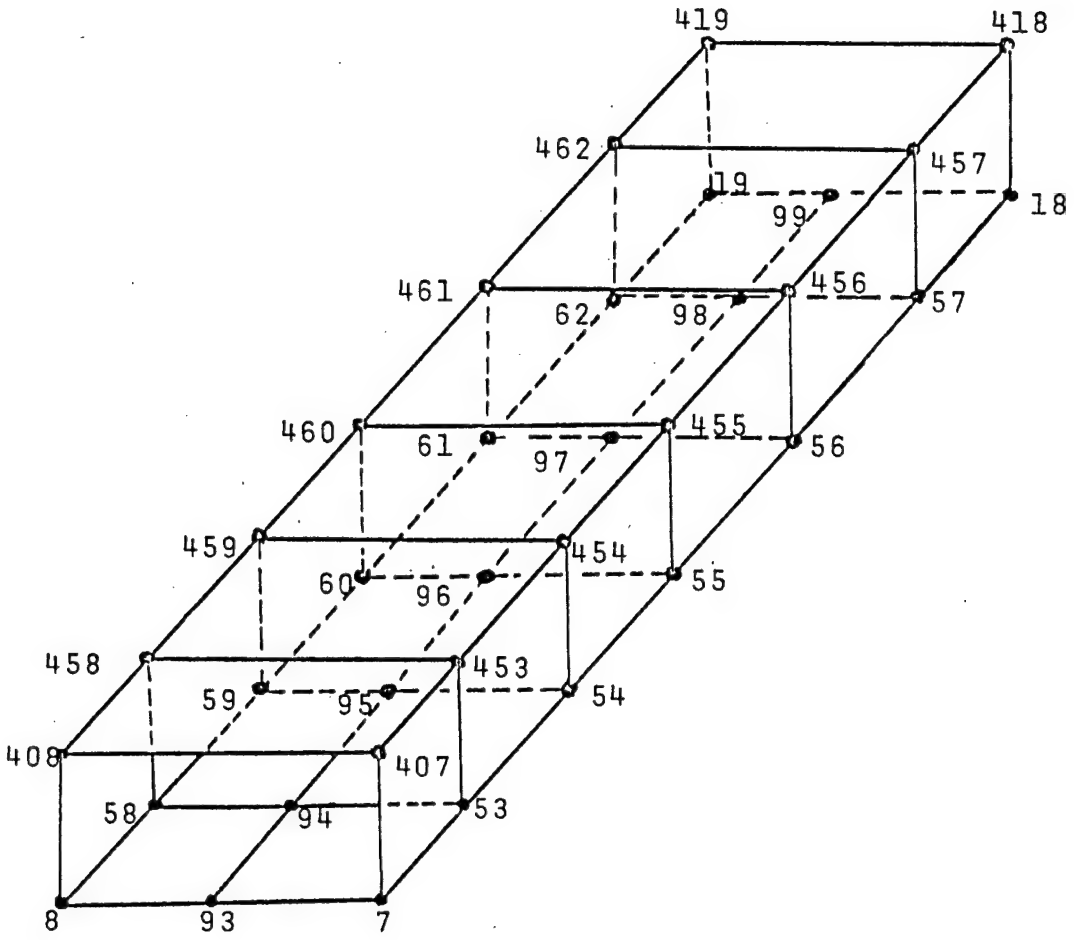
Back and Right Side View of Seat Pallet Structure. Node Points Only Shown.



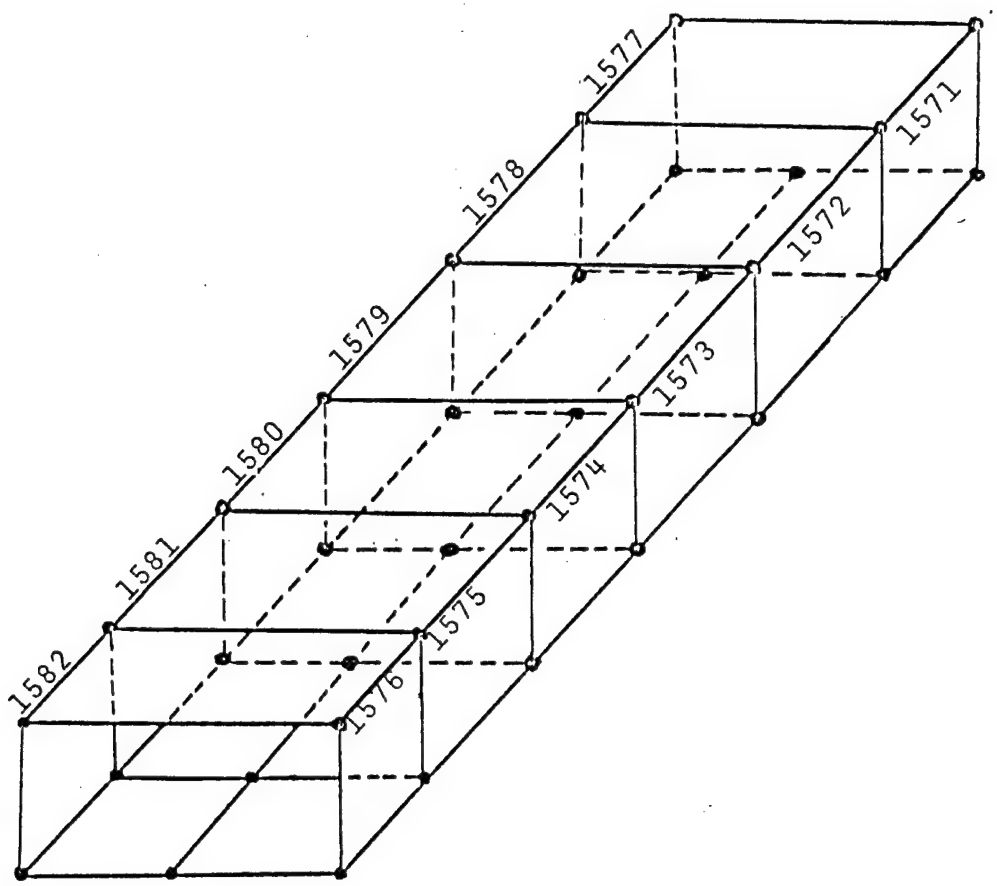
Back and Right Side View of Seat Pallet Structure. Bar Elements Only Shown.



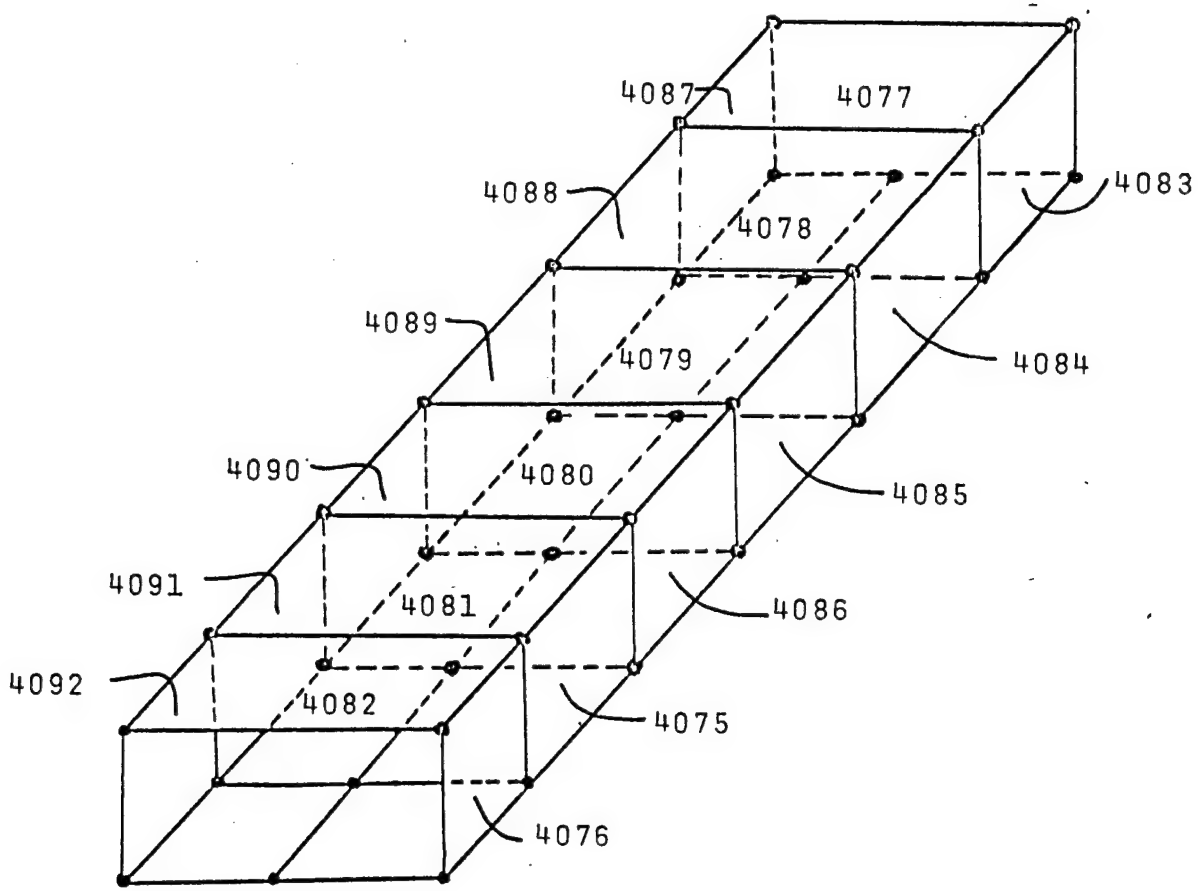
Back and Right Side View of Seat Pallet Structure. Plate Elements Only Shown.



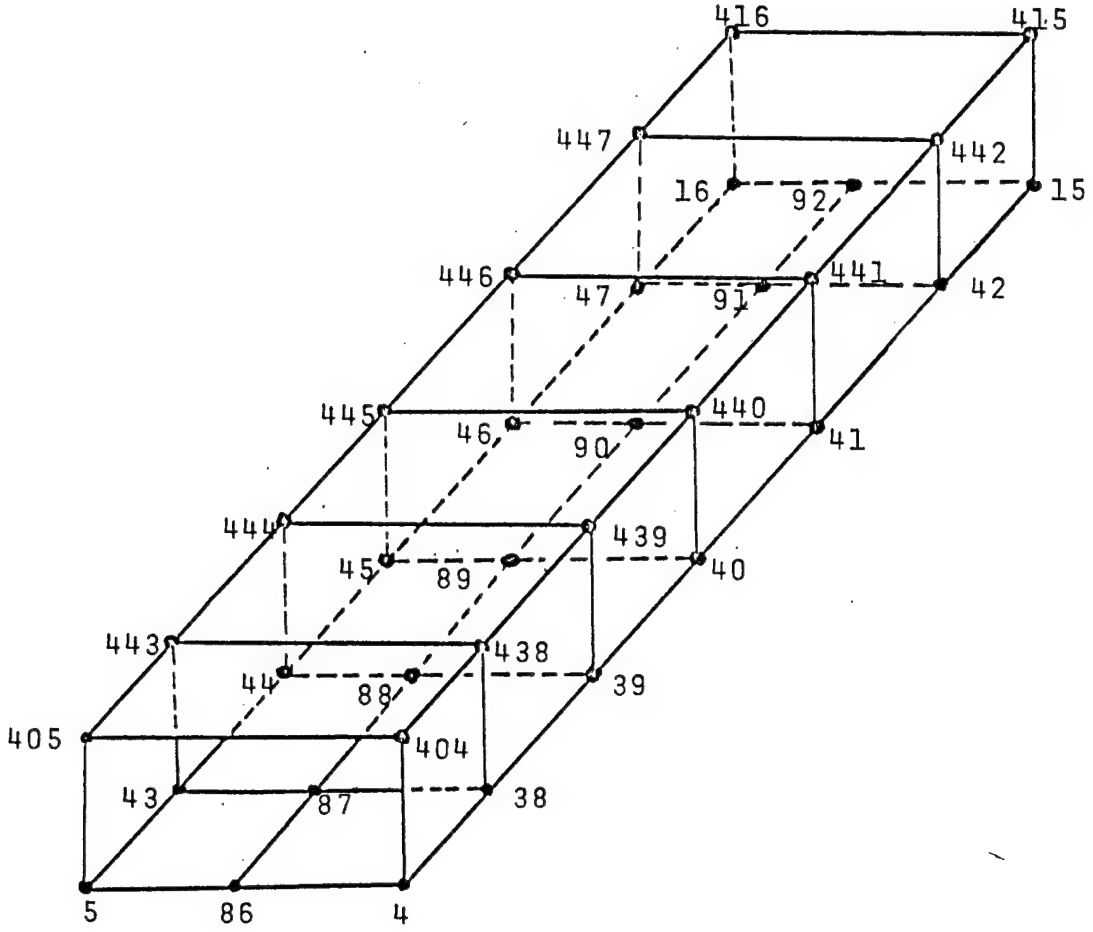
Left Tunnel, Seat Pallet. Node Points Only Shown.



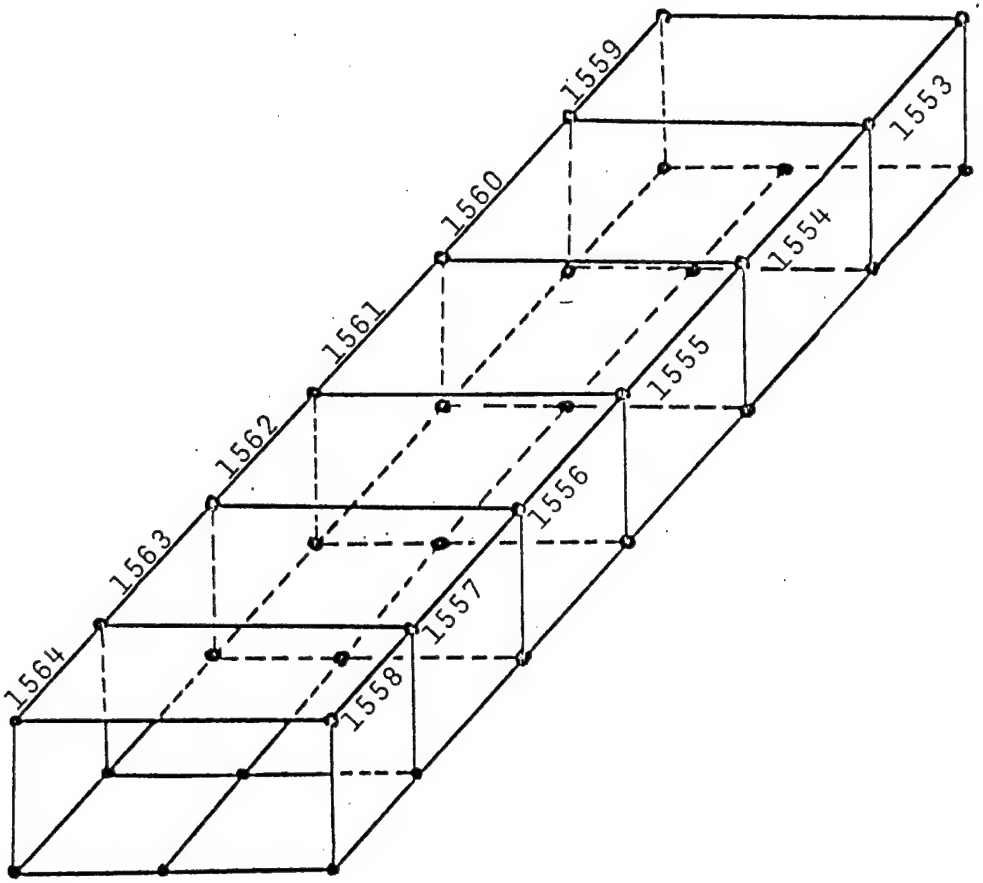
Left Tunnel, Seat Pallet. Bar Elements Only Shown.



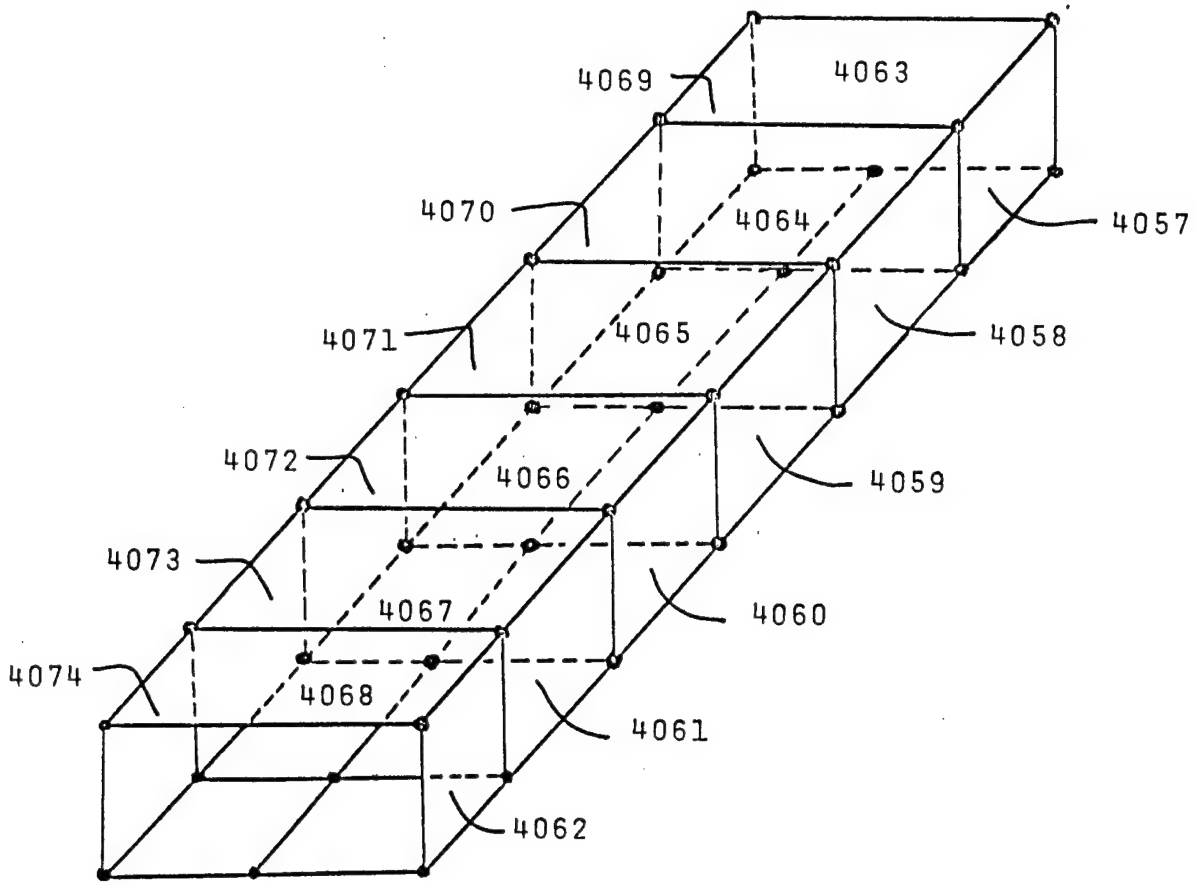
Left Tunnel, Seat Pallet. Plate Eléments Only Shown.



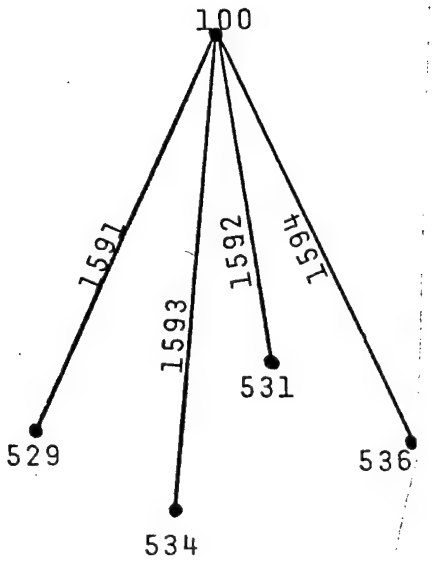
Right Tunnel, Seat Pallet. Node Points Only Shown.



Right Tunnel, Seat Pallet. Bar Elements Only Shown.



Right Tunnel, Seat Pallet. Plate Elements Only Shown.



Airman and Mass, Seat Pallet,
Nodes and Bar Elements Shown.

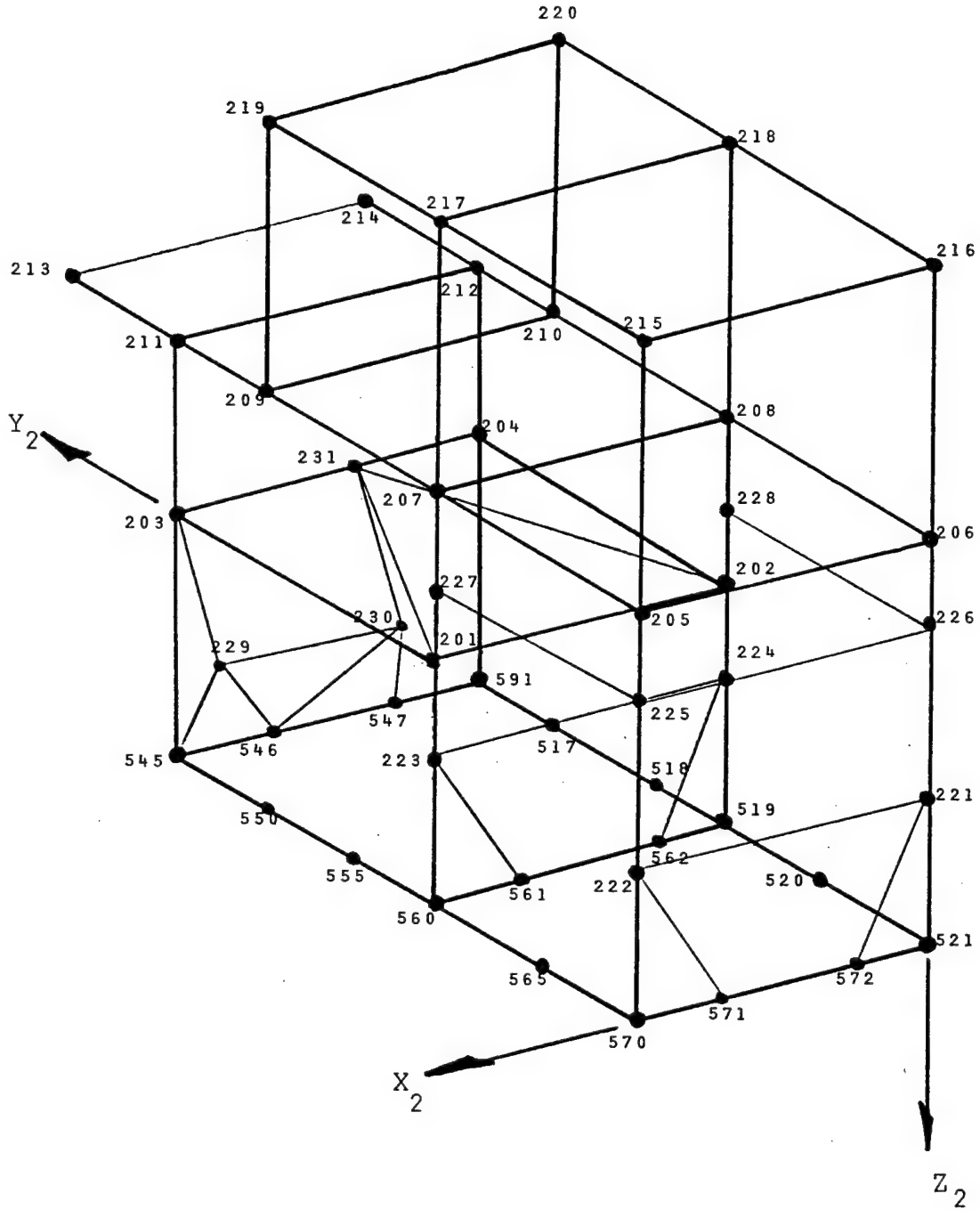


Table Model, Nodal points only given.

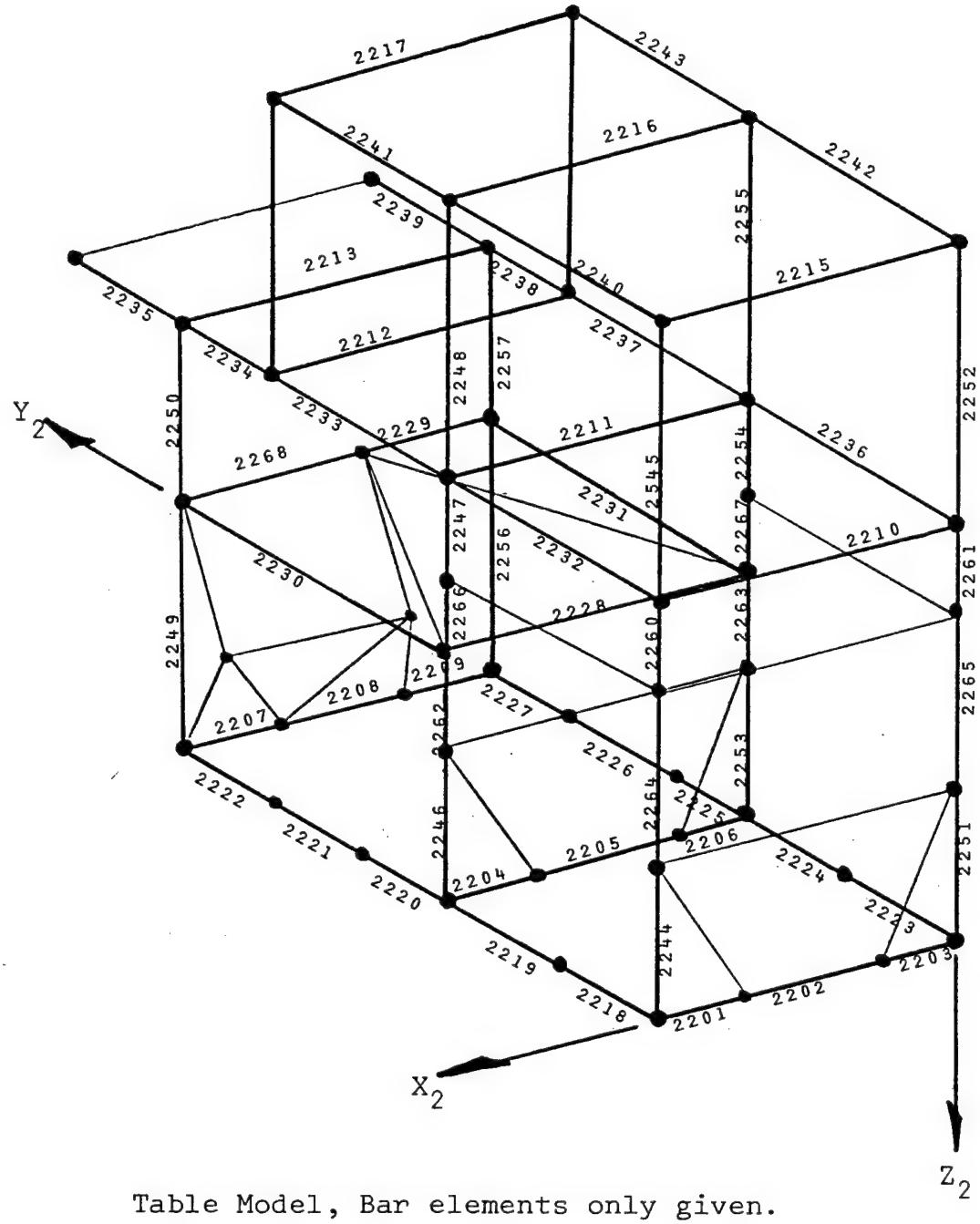


Table Model, Bar elements only given.

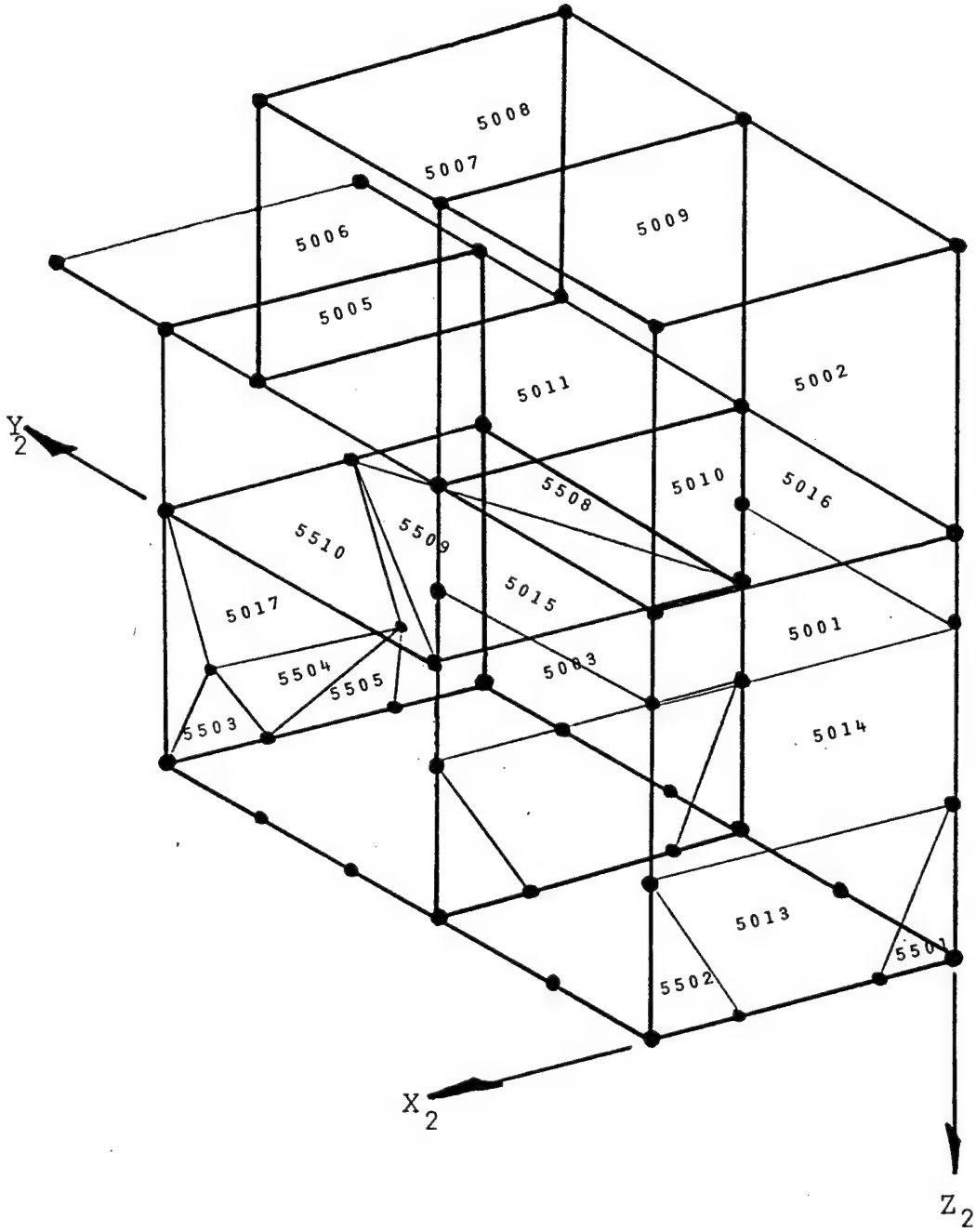


Table Model, Plate elements only.

APPENDIX E

PBAR PROPERTY CALCULATIONS

Included in this appendix are the detailed calculations for determining the cross-section properties used for the PBAR cards of NASTRAN. As an aid to the preparation of this data, the Anamet's computer program INERTIA has been used (reference 5).

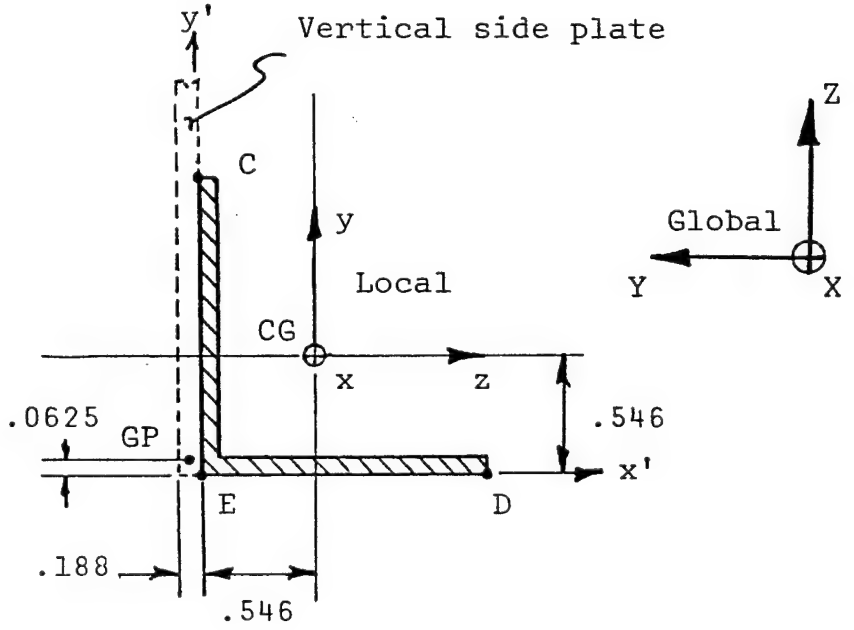
STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 1

ELEMENT NUMBERS: 3001-3004
3006-3007
3009-3016
3018-3019
3021-3024

DESCRIPTION: 2 x 2 x $\frac{1}{8}$ x 103.75 Angle

(Part No. -39, Al 2024-T3)



PROPERTY NUMBER: 1 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+1.454	-.546
D	-.546	+1.454
E	-.546	-.546

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
3001-3004, 3006-3007, 3009-3012	0.	-.640	+.4835	0.	-.640	+.4835
3013-3016, 3018-3019, 3021-3024	0.	+.640	+.4835	0.	+.640	+.4835

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PBAR NO. 1

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.87500	.12500	0.00000	0.00000	.12500	1.06300	90.00000
RECT	0.00	2.00000	.12500	0.00000	0.00000	1.00000	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.23438	.06250	1.06300	.06866	.00031	-.00000	.00122
2	.25000	1.00000	.06250	.00033	.08333	0.00000	.00130

TOTAL AREA=	.484E+00	
X CENTROID DISTANCE=	.546E+00	
Y CENTROID DISTANCE=	.547E+00	
IX (ABOUT CENTROID)=	.190E+00	
IY (ABOUT CENTROID)=	.190E+00	
IXY (ABOUT CENTROID)=	-.113E+00	
IMAX=	.303E+00	
IMIN=	.766E-01	
ALPHA=	.450E+02	
TORSIONAL CONSTANT, K=	.252E-02	
IX (ABOUT INPUT AXIS)=	.335E+00	Y= 0.
IY (ABOUT INPUT AXIS)=	.335E+00	X= 0.
IXY (ABOUT INPUT AXIS)=	.312E-01	

TORSIONAL CONSTANT BASED ON SUM
NOT NECESSARILY ACCURATE

STRUCTURE: Rack Pallet 75-0010

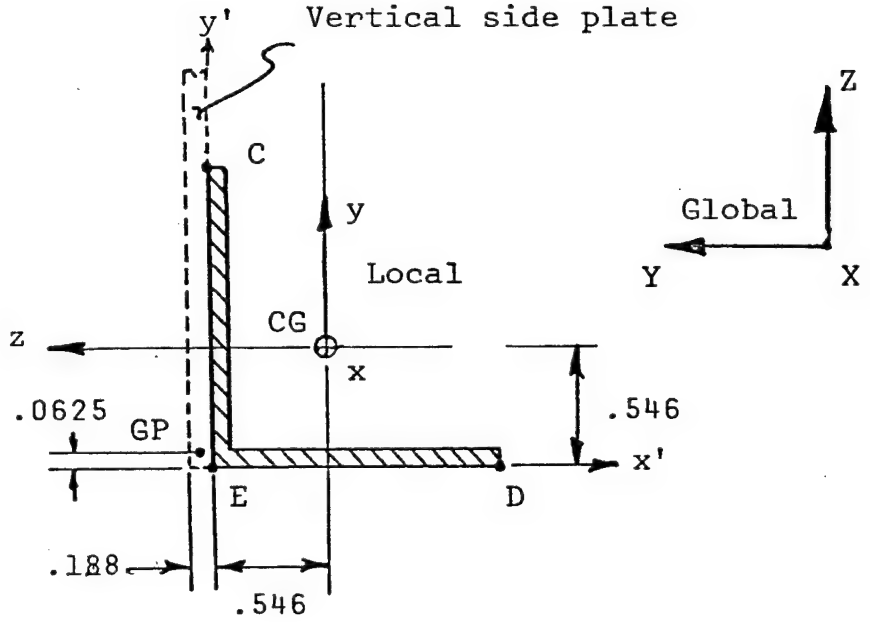
PROPERTY NUMBER: 2 and 3

ELEMENT NUMBERS: 4001-4004, 4013-4016, 4095-4102 } PID No. 2

4005-4012, 4017-4024 } PID No. 3

DESCRIPTION: 2 x 2 x $\frac{1}{8}$ x 103.75 Angle

(Part No. -39, Al 2024-T3)



PROPERTY NUMBER: 2 and 3 (continued)

CALCULATIONS:

See INERTIA program output for PBAR No. 1.

STRESS RECOVERY POINTS

Point	y	z
C	1.454	.546
D	-.546	-1.454
E	-.546	+ .546

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B

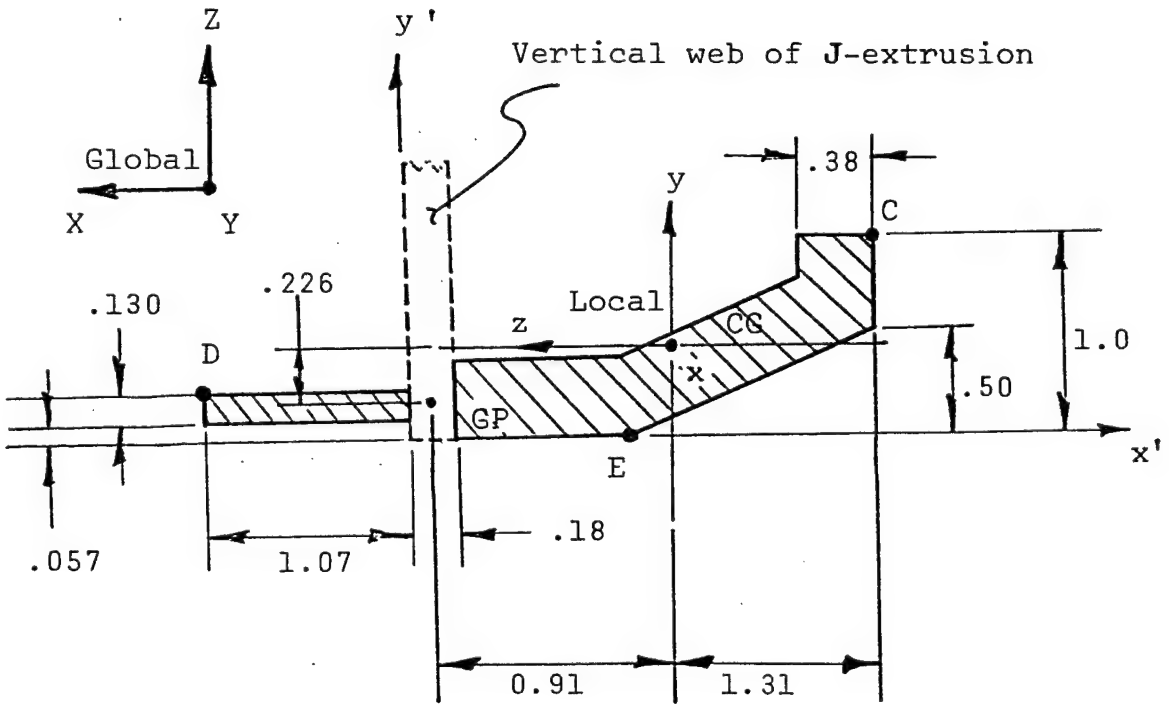
NONE

STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 4

ELEMENT NUMBERS: 3025-3040

DESCRIPTION: Bottom Flange of Al 2024-T3 J-extrusion



PROPERTY NUMBER: 4 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+0.652	-1.310
D	-0.161	+2.070
E	-0.348	-0.055

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
3025-3032	-0.91	0.	+0.226	-0.91	0.	+0.226
3033-3040	+0.91	0.	+0.226	+0.91	0.	+0.226

INERTIA

BAR PROPERTY NUMBER

DESCRIPTION-PID NO 4 BOTTOM FLANGE OF J-EXTRUSION (RACK PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.07000	.13000	0.00000	0.00000	-.53500	.05700	0.00000
RECT	0.00	.87500	.38000	0.00000	0.00000	.61800	0.00000	0.00000
RECT	0.00	.87500	.38000	0.00000	0.00000	1.40300	0.00000	0.00000
RTRI	-1.00	.38000	.87500	0.00000	0.00000	1.84000	0.00000	90.00000
RTRI	0.00	.33300	.87500	0.00000	0.00000	1.84000	.38000	90.00000
RECT	0.00	1.00000	.38000	0.00000	0.00000	2.22000	.50000	90.00000
RTRI	-1.00	.12000	.38000	0.00000	0.00000	2.22000	.38000	90.00000
RECT	-1.00	.38000	.38000	0.00000	0.00000	2.03000	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.13910	-.53500	.12200	.00020	.01327	0.00000	.00078
2	.33250	.61800	.19000	.00400	.02121	0.00000	.01600
3	.33250	1.40300	.19000	.00400	.02121	0.00000	.01600
4	-.16625	1.54833	.12667	-.00133	-.00707	.01382	-.00841
5	.14569	1.54833	.49100	.00090	.00620	-.01061	.00709
6	.38000	2.03000	.50000	.03167	.00457	-.00000	.01829
7	-.02280	2.09333	.42000	-.00002	-.00018	.00026	-.00020
8	-.14440	2.03000	.19000	-.00174	-.00174	0.00000	-.00695

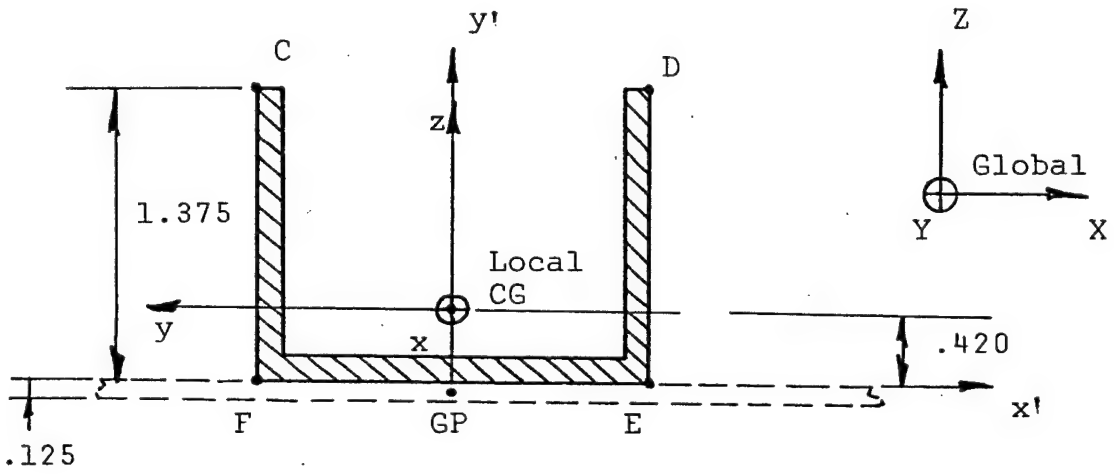
```
TOTAL AREA=                   .996E+00
X CENTROID DISTANCE=          .100E+01
Y CENTROID DISTANCE=          .348E+00
IX (ABOUT CENTROID)=          .613E-01
IY (ABOUT CENTROID)=          .704E+00
IXY (ABOUT CENTROID)=         .163E+00
IMAX=                         .743E+00
IMIN=                         .221E-01
ALPHA=                       -.167E+03
TORSIONAL CONSTANT, K=        .426E-01
IX (ABOUT INPUT AXIS)=        .182E+00          Y= 0.
IY (ABOUT INPUT AXIS)=        .170E+01          X= 0.
IXY (ABOUT INPUT AXIS)=       .510E+00

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 5

ELEMENT NUMBERS: 3041-3052
3065-3070
3083-3094

DESCRIPTION: 3 x $1\frac{3}{8}$ x $\frac{1}{4}$ Channel (Al 6061-T6)



PROPERTY NUMBER: 5 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+1.500	+.955
D	-1.500	+.955
E	-1.500	-.420
F	+1.500	-.420

SHEAR FACTORS

$$K_1 = \frac{3(\frac{1}{4})}{1.31} = .573$$

$$K_2 = \frac{2\ (1.375)(\frac{1}{4})}{1.31} = .525$$

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
3041-3052 3065-3070 3083-3094	0.	0.	+.4865	0.	0.	+.4865

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 5 3X1.375X.25 BOTTOM CHANNEL (RACK PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	2.50000	.25000	0.00000	0.00000	0.00000	0.00000	0.00000
RECT	0.00	.25000	1.37500	0.00000	0.00000	-1.37500	0.00000	0.00000
RECT	0.00	.25000	1.37500	0.00000	0.00000	1.37500	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.62500	0.00000	.12500	.00326	.32552	0.00000	.01302
2	.34375	-1.37500	.68750	.05416	.00179	0.00000	.00716
3	.34375	1.37500	.68750	.05416	.00179	0.00000	.00716

```
*****
*****   TOTAL AREA=                  .131E+01
*****   X CENTROID DISTANCE=      0.
*****   Y CENTROID DISTANCE=         .420E+00
*****   IX (ABOUT CENTROID)=         .215E+00
*****   IY (ABOUT CENTROID)=         .163E+01
*****   IXY (ABOUT CENTROID)=     0.
*****   IMAX=                        .163E+01
*****   IMIN=                        .215E+00
*****   ALPHA=                      -.180E+03
*****   TORSIONAL CONSTANT, K=       .273E-01
*****   IX (ABOUT INPUT AXIS)=       .446E+00          Y= 0.
*****   IY (ABOUT INPUT AXIS)=       .163E+01          X= 0.
*****   IXY (ABOUT INPUT AXIS)=   0.
*****
*****   TORSIONAL CONSTANT BASED ON SUM
*****          NOT NECESSARILY ACCURATE
```

STRUCTURE: Seat Pallet 75-0010

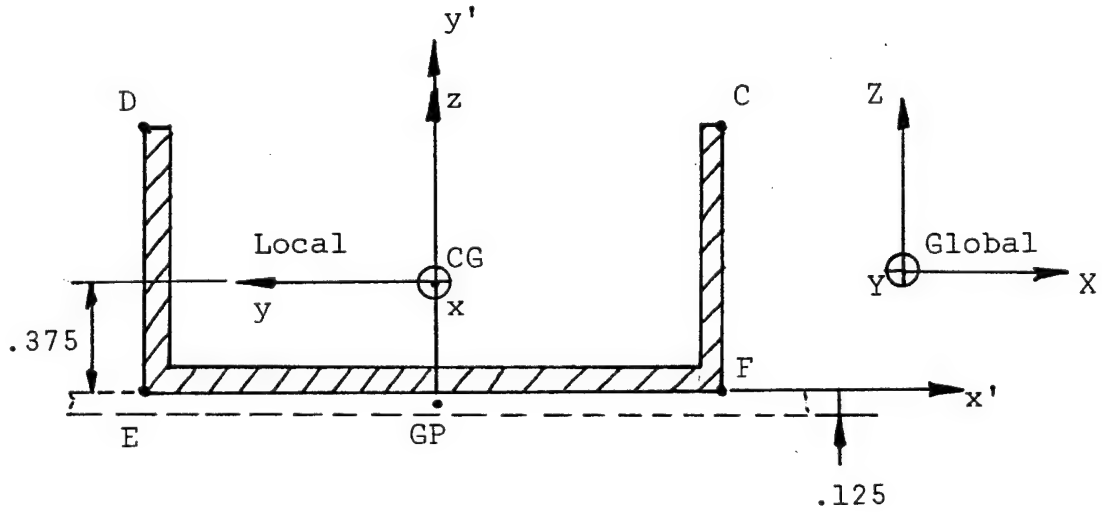
PROPERTY NUMBER: 5

ELEMENT NUMBERS:

1041-1052
1065-1070
1083-1094
2053-2064 (top channel)

DESCRIPTION: Bottom Channel

(3 x $1\frac{3}{8}$ x $\frac{1}{8}$ channel, AL 2024-T3)



PROPERTY NUMBER: 5 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	-1.500	+1.000
D	+1.500	+1.000
E	+1.500	-1.000
F	-1.500	-1.000

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
1041-1052, 1065-1070, 1083-1094	0.	0.	+.4375	0.	0.	+.4375
2053-2064	0.	0.	-.415	0.	0.	-.415

SHEAR FACTORS

$$K_1 = \frac{3(\frac{1}{8})}{.688} = .545$$

$$K_2 = \frac{2(1\frac{3}{8})(\frac{1}{8})}{.688} = .500$$

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID 5 BOTTOM CHANNELS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	2.75000	.12500	0.00000	0.00000	0.00000	0.00000	0.00000
RECT	0.00	.12500	1.37500	0.00000	0.00000	-1.43750	0.00000	0.00000
RECT	0.00	.12500	1.37500	0.00000	0.00000	1.43750	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.34375	0.00000	.06250	.00045	.21663	0.00000	.00179
2	.17188	-1.43750	.68750	.02708	.00022	0.00000	.00090
3	.17188	1.43750	.68750	.02708	.00022	0.00000	.00090

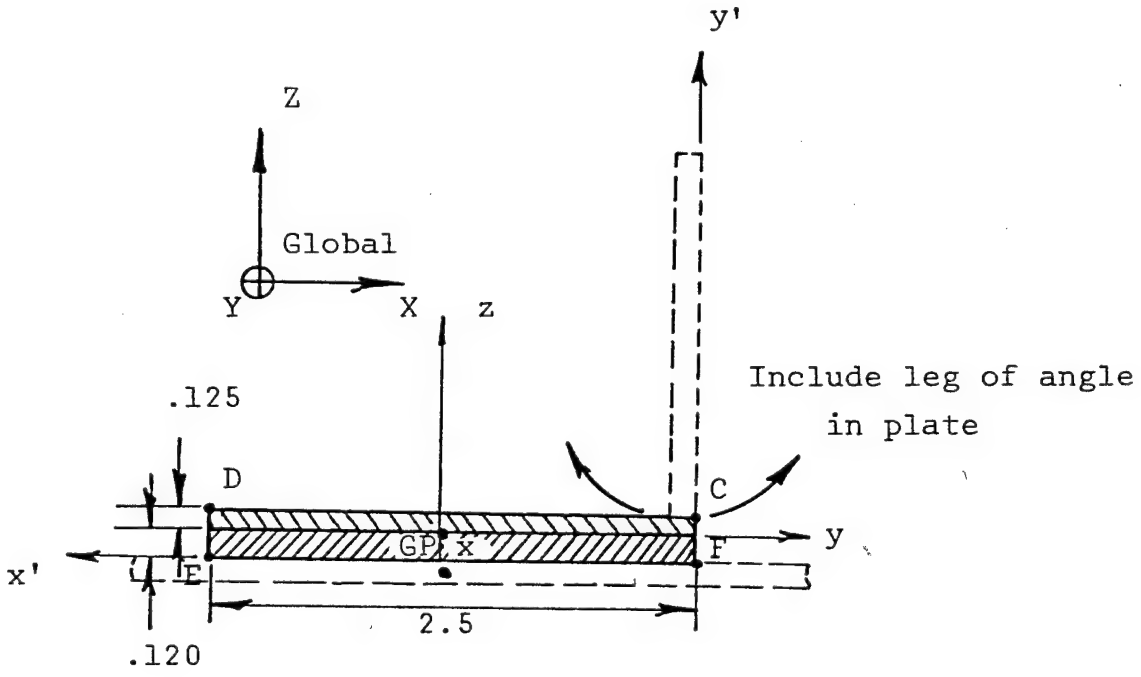
```
TOTAL AREA=                  .688E+00
X CENTROID DISTANCE=        0.
Y CENTROID DISTANCE=         .375E+00
IX (ABOUT CENTROID)=         .122E+00
IY (ABOUT CENTROID)=         .927E+00
IXY (ABOUT CENTROID)=       0.
IMAX=                        .927E+00
IMIN=                        .122E+00
ALPHA=                      -.180E+03
TORSIONAL CONSTANT, K=       .358E-02
IX (ABOUT INPUT AXIS)=       .218E+00          Y= 0.
IY (ABOUT INPUT AXIS)=       .927E+00          X= 0.
IXY (ABOUT INPUT AXIS)=     0.

TORSIONAL CONSTANT BASED ON SUM
     .  NOT NECESSARILY ACCURATE
```

STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 6

ELEMENT NUMBERS: 3053-3064
3071-3082

DESCRIPTION: Angle at fork lift tunnel
(2.5 x 2.5 x $\frac{1}{8}$ angle Al 2024-T3)



PROPERTY NUMBER: 6 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+1.25	.122
D	-1.25	.122
E	-1.25	-.123
F	+1.25	-.123

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B

None

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 6 BOTTOM HOR. MEMBER ON TUNNEL (RACK PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	2.50000	.12000	0.00000	0.00000	1.25000	0.00000	0.00000
RECT	0.00	2.50000	.12500	0.00000	0.00000	1.25000	.12000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.30000	1.25000	.06000	.00036	.15625	0.00000	.00144
2	.31250	1.25000	.18250	.00041	.16276	0.00000	.00163

```
*****
*****   TOTAL AREA=                  .613E+00
*****   X CENTROID DISTANCE=         .125E+01
*****   Y CENTROID DISTANCE=         .123E+00
*****   IX (ABOUT CENTROID)=         .306E-02
*****   IY (ABOUT CENTROID)=         .319E+00
*****   IXY (ABOUT CENTROID)=     0.
*****   IMAX=                        .319E+00
*****   IMIN=                        .306E-02
*****   ALPHA=                      -.180E+03
*****   TORSIONAL CONSTANT, K=       .307E-02
*****   IX (ABOUT INPUT AXIS)=       .123E-01        Y= 0.
*****   IY (ABOUT INPUT AXIS)=       .128E+01        X= 0.
*****   IXY (ABOUT INPUT AXIS)=      .938E-01
*****
*****   TORSIONAL CONSTANT BASED ON SUM
*****          NOT NECESSARILY ACCURATE
```

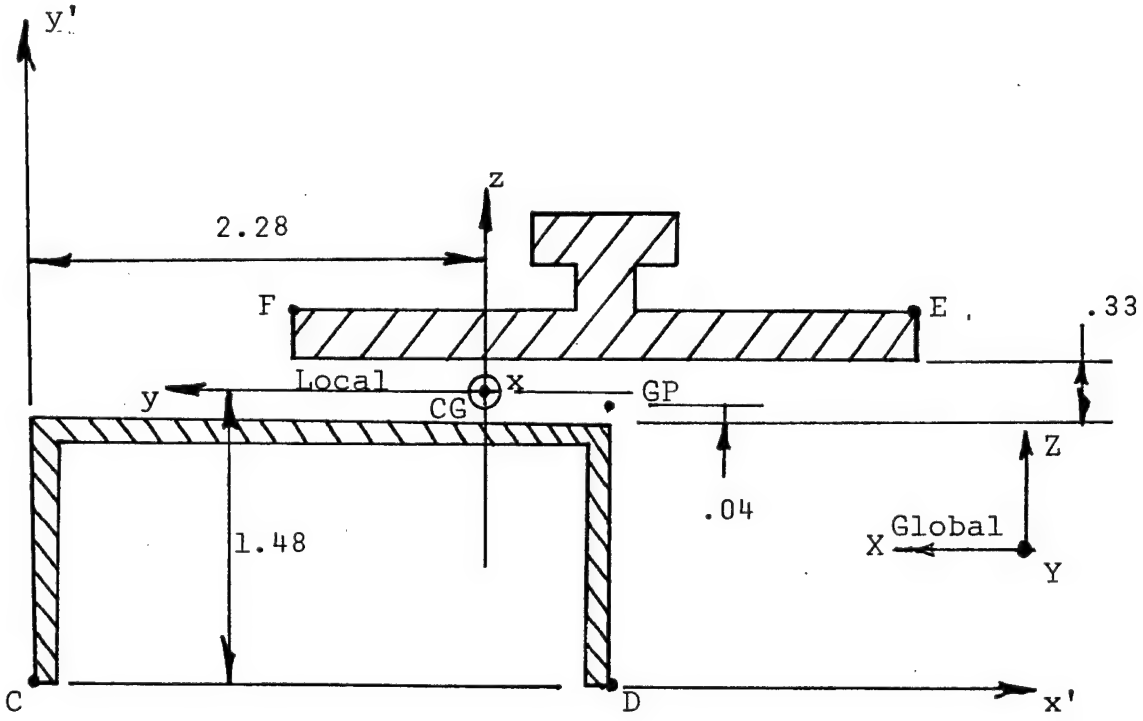
STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 7

ELEMENT NUMBERS: 2042-2045
2048-2051

DESCRIPTION: Seat Rail Support Beams

(3 x $1\frac{3}{8}$ x $\frac{3}{16}$ channel with seat rail, AL 2024-T3)



PROPERTY NUMBER: 7 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+2.280	-1.480
D	-0.720	-1.480
E	-2.345	+0.475
F	+0.905	+0.475

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2042-2045	+0.720	0.	+0.065	+0.720	0.	+0.065
2048-2051	-0.720	0.	+0.065	-0.720	0.	+0.065

SHEAR FACTORS

$$K_1 = \frac{.8125+.07+.21+\frac{1}{8}(3)}{1.78} = .824$$

$$K_2 = \frac{\frac{1}{8}(2)(1.375)+.8125+.07+.21}{1.78} = .807$$

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 7 SEAT RAILS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.18750	1.37500	0.00000	0.00000	.09375	0.00000	0.00000
RECT	0.00	2.62500	.18750	0.00000	0.00000	1.50000	1.18750	0.00000
RECT	0.00	.18750	1.37500	0.00000	0.00000	2.90625	0.00000	0.00000
RECT	0.00	3.25000	.25000	0.00000	0.00000	3.00000	1.70500	0.00000
RECT	0.00	.35000	.20000	0.00000	0.00000	3.00000	1.95500	0.00000
RECT	0.00	.70000	.30000	0.00000	0.00000	3.00000	2.15500	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.25781	.09375	.68750	.04062	.00076	0.00000	.00302
2	.49219	1.50000	1.28125	.00144	.28262	0.00000	.00577
3	.25781	2.90625	.68750	.04062	.00076	0.00000	.00302
4	.81250	3.00000	1.83000	.00423	.71517	0.00000	.01693
5	.07000	3.00000	2.05500	.00023	.00071	0.00000	.00093
6	.21000	3.00000	2.30500	.00158	.00858	0.00000	.00630

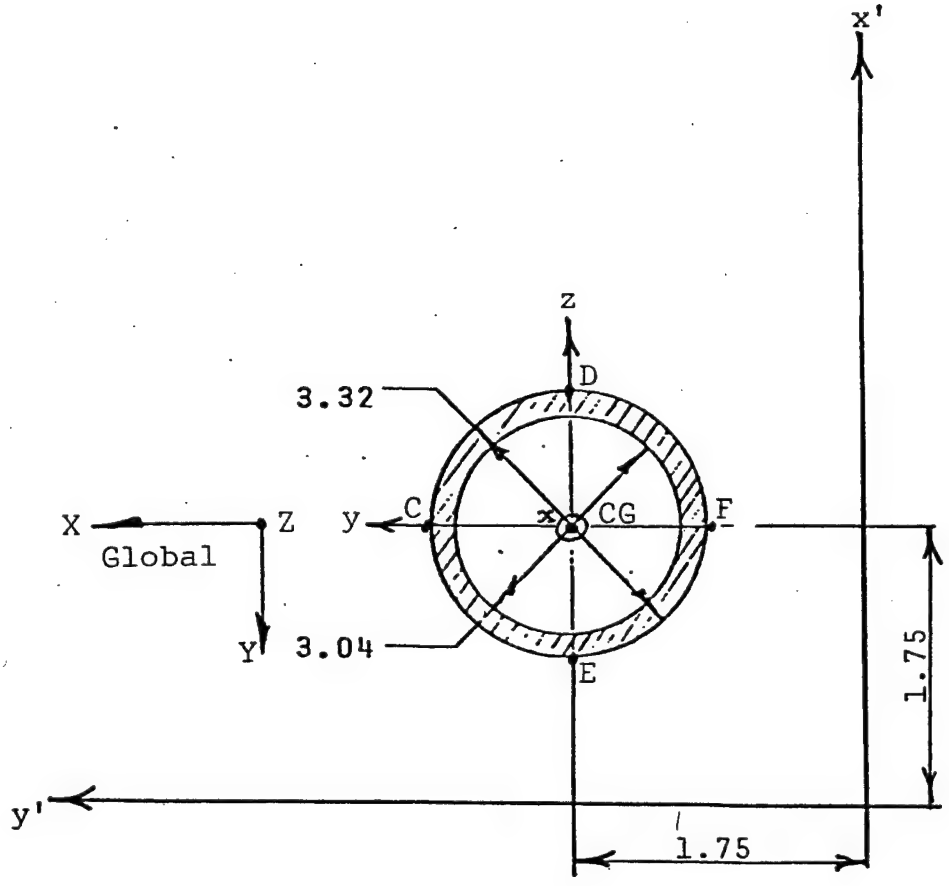
```
TOTAL AREA=                    .210E+01
X CENTROID DISTANCE=           .228E+01
Y CENTROID DISTANCE=           .148E+01
IX (ABOUT CENTROID)=           .698E+00
IY (ABOUT CENTROID)=           .321E+01
IXY (ABOUT CENTROID)=          .754E+00
IMAX=                          .342E+01
IMIN=                          .489E+00
ALPHA=                        -.165E+03
TORSIONAL CONSTANT, K=         .360E-01
IX (ABOUT INPUT AXIS)=         .527E+01          Y= 0.
IY (ABOUT INPUT AXIS)=         .141E+02          X= 0.
IXY (ABOUT INPUT AXIS)=        .782E+01

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 8

ELEMENT NUMBERS: 3583-3590

DESCRIPTION: Corner Post



PROPERTY NUMBER: 8 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+1.66	0.0
D	0.0	+1.66
E	0.0	-1.66
F	-1.66	0.0

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B

None

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PBAR NO. 8

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
CIRC	0.00	1.66000	0.00000	0.00000	0.00000	1.75000	1.75000	0.00000
CIRC	-1.00	1.52000	0.00000	0.00000	0.00000	1.75000	1.75000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	8.65697	1.75000	1.75000	5.96378	5.96378	0.00000	11.92757
2	-7.25833	1.75000	1.75000	-4.19241	-4.19241	0.00000	-8.38482

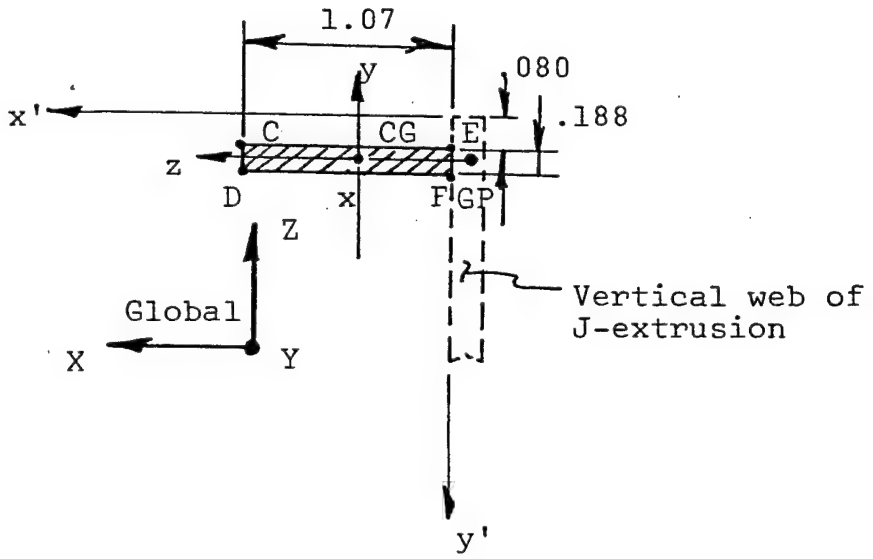
```
*****
*****    TOTAL AREA=                .140E+01
*****    X CENTROID DISTANCE=       .175E+01
*****    Y CENTROID DISTANCE=       .175E+01
*****    IX (ABOUT CENTROID)=       .177E+01
*****    IY (ABOUT CENTROID)=       .177E+01
*****    IXY (ABOUT CENTROID)=     -.284E-13
*****    IMAX=                      .177E+01
*****    IMIN=                      .177E+01
*****    ALPHA=                     .900E+02
*****    TORSIONAL CONSTANT, K=     .354E+01
*****    IX (ABOUT INPUT AXIS)=     .605E+01        Y= 0.
*****    IY (ABOUT INPUT AXIS)=     .605E+01        X= 0.
*****    IXY (ABOUT INPUT AXIS)=    .428E+01
*****
*****    TORSIONAL CONSTANT BASED ON SUM
*****           NOT NECESSARILY ACCURATE
```

STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 9

ELEMENT NUMBERS: 4025-4040

DESCRIPTION: Upper Flange of J-extrusion
(Al 2024-T3)



PROPERTY NUMBER: 9 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+0.094	+0.535
D	-0.094	+0.535
E	+0.094	-0.535
F	-0.094	-0.535

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
None						

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 9 TOP FLANGE OF J-EXTRUSION (RACK PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.07000	.18800	0.00000	0.00000	.53500	.08000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.20116	.53500	.17400	.00059	.01919	0.00000	.00237

```
TOTAL AREA=                    .201E+00
X CENTROID DISTANCE=           .535E+00
Y CENTROID DISTANCE=           .174E+00
IX (ABOUT CENTROID)=           .592E-03
IY (ABOUT CENTROID)=           .192E-01
IXY (ABOUT CENTROID)=          .222E-15
IMAX=                          .192E-01
IMIN=                          .592E-03
ALPHA=                        -.180E+03
TORSIONAL CONSTANT, K=         .237E-02
IX (ABOUT INPUT AXIS)=         .668E-02          Y= 0.
IY (ABOUT INPUT AXIS)=         .768E-01          X= 0.
IXY (ABOUT INPUT AXIS)=        .187E-01

TORSIONAL CONSTANT BASED ON SUM
       NOT NECESSARILY ACCURATE
```

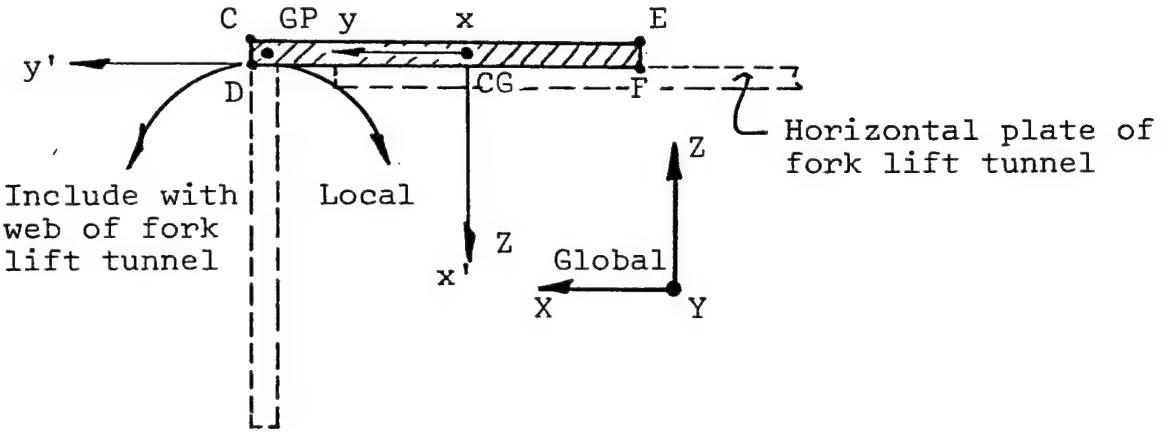
STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 10

ELEMENT NUMBERS: 3553-3582

DESCRIPTION: Fork lift tunnel beam

($\frac{1}{8}$ x 2 leg of angle, Al 2024-T3)



PROPERTY NUMBER: 10 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+1.00	-.0625
D	+1.00	+.0625
E	-1.00	-.0625
F	-1.00	+.0625

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B

None

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 10 TOP HOR. MEMBER OF TUNNEL (RACK PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	2.00000	.12500	0.00000	0.00000	0.00000	0.00000	90.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.25000	-.06250	.00000	.08333	.00033	-.00000	.00130

TOTAL AREA=	.250E+00	
X CENTROID DISTANCE=	-.625E-01	
Y CENTROID DISTANCE=	.520E-06	
IX (ABOUT CENTROID)=	.833E-01	
IY (ABOUT CENTROID)=	.326E-03	
IXY (ABOUT CENTROID)=	-.691E-06	
IMAX=	.833E-01	
IMIN=	.326E-03	
ALPHA=	.477E-03	
TORSIONAL CONSTANT, K=	.130E-02	
IX (ABOUT INPUT AXIS)=	.833E-01	Y= 0.
IY (ABOUT INPUT AXIS)=	.130E-02	X= 0.
IXY (ABOUT INPUT AXIS)=	-.699E-06	

TORSIONAL CONSTANT BASED ON SUM
NOT NECESSARILY ACCURATE

STRUCTURE: Rack Pallet 75-0010

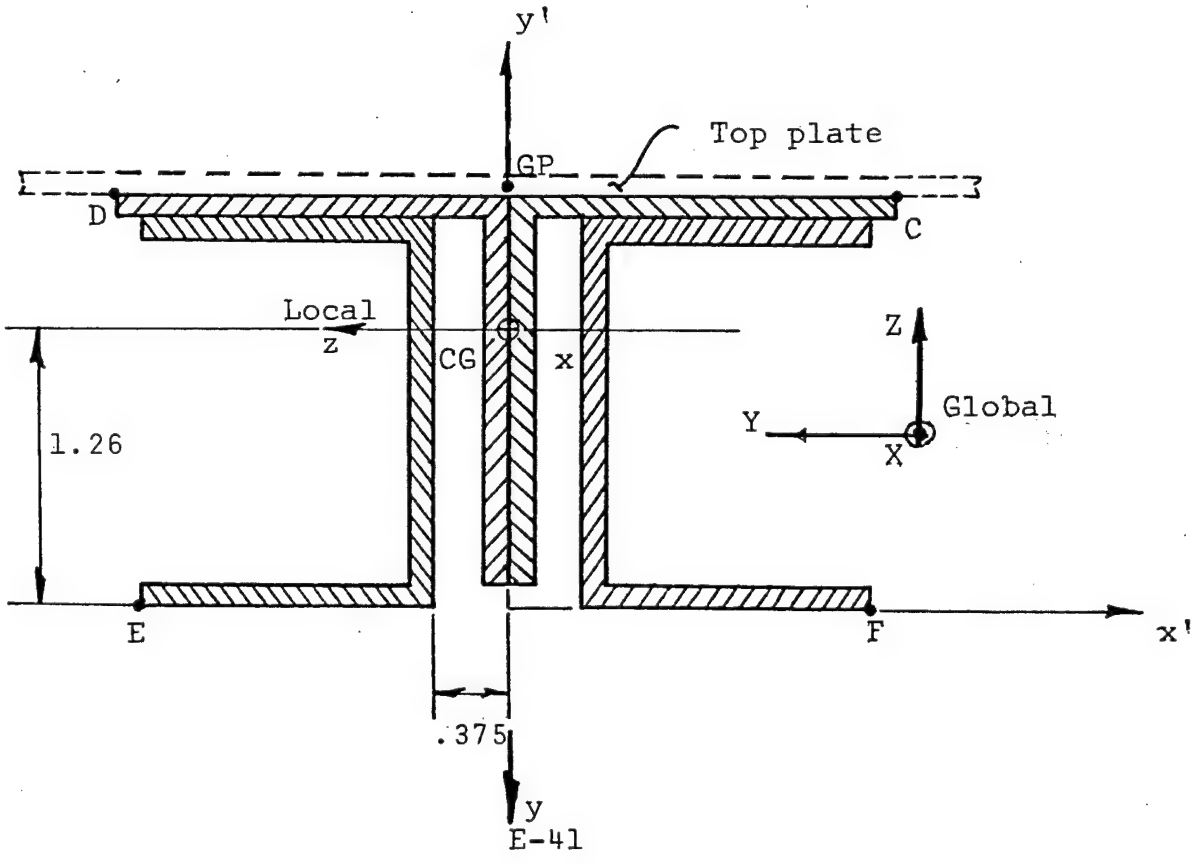
PROPERTY NUMBER: 11

ELEMENT NUMBERS: 4053-4058
4061-4063
4066-4075
4078-4080

DESCRIPTION: Rack support beams

(Two 2 x 2 x $\frac{1}{8}$ angles with two

2 x $1\frac{1}{2}$ x $\frac{1}{8}$ channels Al 2024-T3)



PROPERTY NUMBER: 11 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	-.865	-2.00
D	-.865	+2.00
E	+1.260	+1.875
F	+1.260	-1.875

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
4053-4058, 4061-4063, 4066-4075, 4078-4080, 4083-4086	0.	0.	-0.905	0.	0.	-0.905

SHEAR FACTORS

$$K_1 = \frac{2(2)(\frac{1}{8})+2(2)(\frac{1}{8})}{2.16} = .463$$

$$K_2 = \frac{4(\frac{1}{8})+4(1.5)(\frac{1}{8})}{2.16} = .579$$

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 11 RACK SUPPORT BEAM (RACK PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.37500	.12500	0.00000	0.00000	-1.18750	0.00000	0.00000
RECT	0.00	1.37500	.12500	0.00000	0.00000	1.18750	0.00000	0.00000
RECT	0.00	.12500	2.00000	0.00000	0.00000	-.43750	0.00000	0.00000
RECT	0.00	.12500	2.00000	0.00000	0.00000	.43750	0.00000	0.00000
RECT	0.00	1.37500	.12500	0.00000	0.00000	-1.18750	1.87500	0.00000
RECT	0.00	1.37500	.12500	0.00000	0.00000	1.18750	1.87500	0.00000
RECT	0.00	.12500	2.00000	0.00000	0.00000	-.06250	.12500	0.00000
RECT	0.00	.12500	2.00000	0.00000	0.00000	.06250	.12500	0.00000
RECT	0.00	1.87500	.12500	0.00000	0.00000	-1.06250	2.00000	0.00000
RECT	0.00	1.87500	.12500	0.00000	0.00000	1.06250	2.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.17188	-1.18750	.06250	.00022	.02708	0.00000	.00090
2	.17188	1.18750	.06250	.00022	.02708	0.00000	.00090
3	.25000	-.43750	1.00000	.08333	.00033	0.00000	.00130
4	.25000	.43750	1.00000	.08333	.00033	0.00000	.00130
5	.17188	-1.18750	1.93750	.00022	.02708	0.00000	.00090
6	.17188	1.18750	1.93750	.00022	.02708	0.00000	.00090
7	.25000	-.06250	1.12500	.08333	.00033	0.00000	.00130
8	.25000	.06250	1.12500	.08333	.00033	0.00000	.00130
9	.23438	-1.06250	2.06250	.00031	.06866	0.00000	.00122
10	.23438	1.06250	2.06250	.00031	.06866	0.00000	.00122

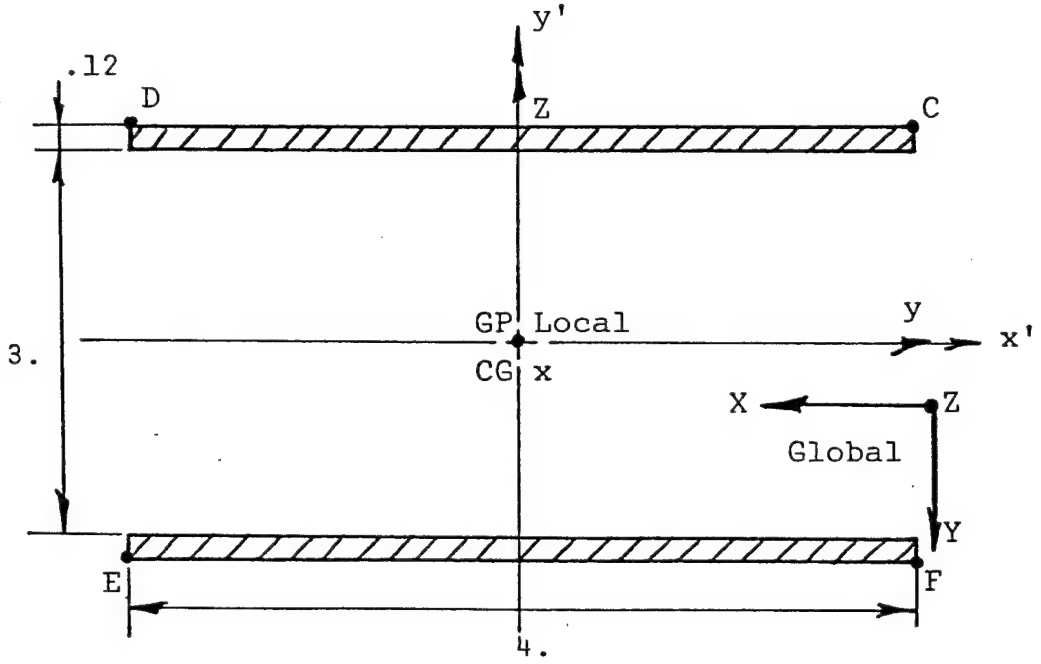
```
TOTAL AREA=                  .216E+01
X CENTROID DISTANCE=        0.
Y CENTROID DISTANCE=         .126E+01
IX (ABOUT CENTROID)=         .133E+01
IY (ABOUT CENTROID)=         .184E+01
IXY (ABOUT CENTROID)=       0.
IMAX=                        .184E+01
IMIN=                        .133E+01
ALPHA=                      -.180E+03
TORSIONAL CONSTANT, K=       .112E-01
IX (ABOUT INPUT AXIS)=       .475E+01          Y= 0.
IY (ABOUT INPUT AXIS)=       .184E+01          X= 0.
IXY (ABOUT INPUT AXIS)=     0.

TORSIONAL CONSTANT BASED ON SUM
       NOT NECESSARILY ACCURATE
```

STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 12

ELEMENT NUMBERS: 3592
3593
3596
3599
3603
3604
3607
3610

DESCRIPTION: Clip between rack beam support and bottom channels (A1 2024-T3)



PROPERTY NUMBER: 12 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+2.00	+1.62
D	-2.00	+1.62
E	-2.00	-1.62
F	+2.00	-1.62

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
None						

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 12 CLIP, PN 81 (RACK PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	4.00000	.12000	0.00000	0.00000	0.00000	1.50000	0.00000
RECT	0.00	4.00000	.12000	0.00000	0.00000	0.00000	-1.62000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.48000	0.00000	1.56000	.00058	.64000	0.00000	.00230
2	.48000	0.00000	-1.56000	.00058	.64000	0.00000	.00230

```
TOTAL AREA=                  .960E+00
X CENTROID DISTANCE=        0.
Y CENTROID DISTANCE=        0.
IX (ABOUT CENTROID)=         .234E+01
IY (ABOUT CENTROID)=         .128E+01
IXY (ABOUT CENTROID)=       0.
IMAX=                        .234E+01
IMIN=                        .128E+01
ALPHA=                      -.909E-12
TORSIONAL CONSTANT, K=       .461E-02
IX (ABOUT INPUT AXIS)=       .234E+01          Y= 0.
IY (ABOUT INPUT AXIS)=       .128E+01          X= 0.
IXY (ABOUT INPUT AXIS)=     0.

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 12

ELEMENT NUMBERS:

DESCRIPTION: Simulation of seat structure connecting mass of airman and seat to seat rails.

PROPERTY NUMBER: 12 (continued)

CALCULATIONS:

$A = .79$

$I_1 = I_2 = .05$

$J = .10$

STRESS RECOVERY POINTS

Point	y	z
None		

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
None						

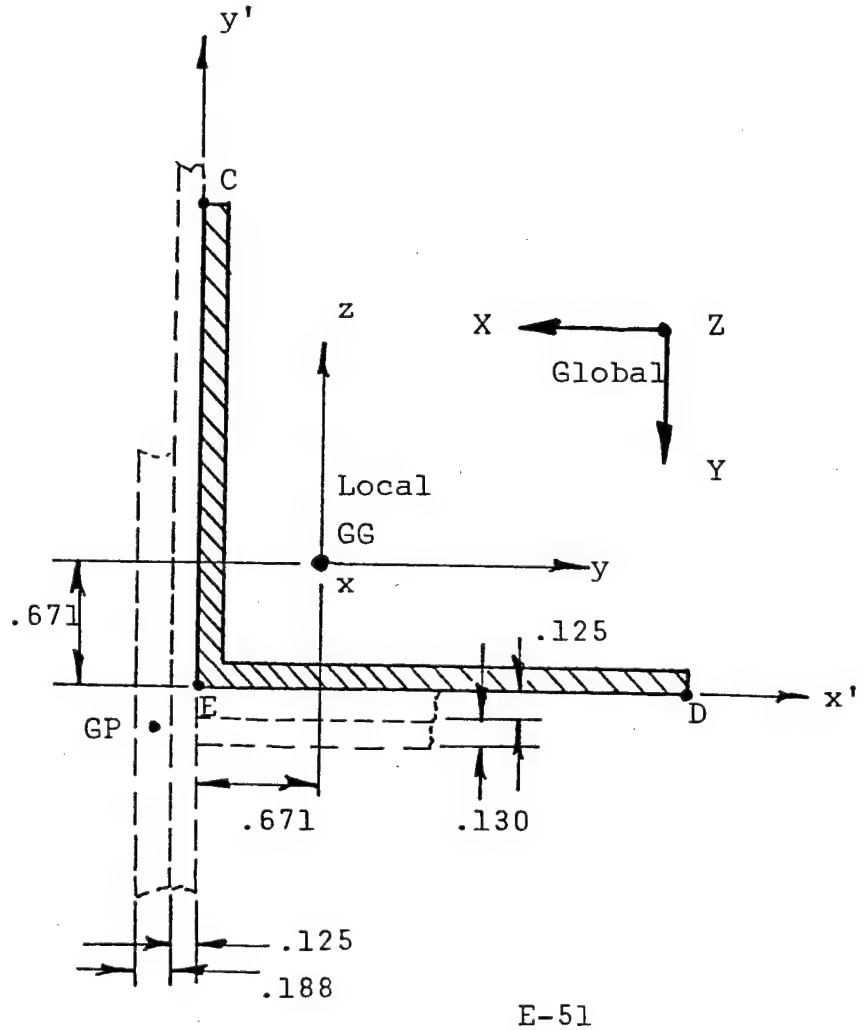
STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 13

ELEMENT NUMBERS: 3613-3628

DESCRIPTION: Vertical tunnel members

($2\frac{1}{2}$ x $2\frac{1}{2}$ x $\frac{1}{8}$ angle, 2024-T3)



PROPERTY NUMBER: 13 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	-.671	1.829
D	1.829	-.671
E	-.671	-.671

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
3613-3614 3617-3618	-.890	-.861	0.	-.890	-.861	0.
3615-3616 3619-3620	+.890	-.861	0.	+.890	-.861	0.
3621-3622 3625-3626	-.890	+.861	0.	-.890	+.861	0.
3623-3624 3627-3628	+.890	+.861	0.	+.890	+.861	0.

SHEAR FACTORS

$$K_1 = K_2 = \frac{(2.5)(\frac{1}{8})}{.609} = .513$$

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 13 VERTICAL MEMBERS OF TUNNEL (RACK PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	2.37500	.12500	0.00000	0.00000	1.31250	0.00000	0.00000
RECT	0.00	.12500	2.50000	0.00000	0.00000	.06250	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.29688	1.31250	.06250	.00039	.13955	0.00000	.00155
2	.31250	.06250	1.25000	.16276	.00041	0.00000	.00163

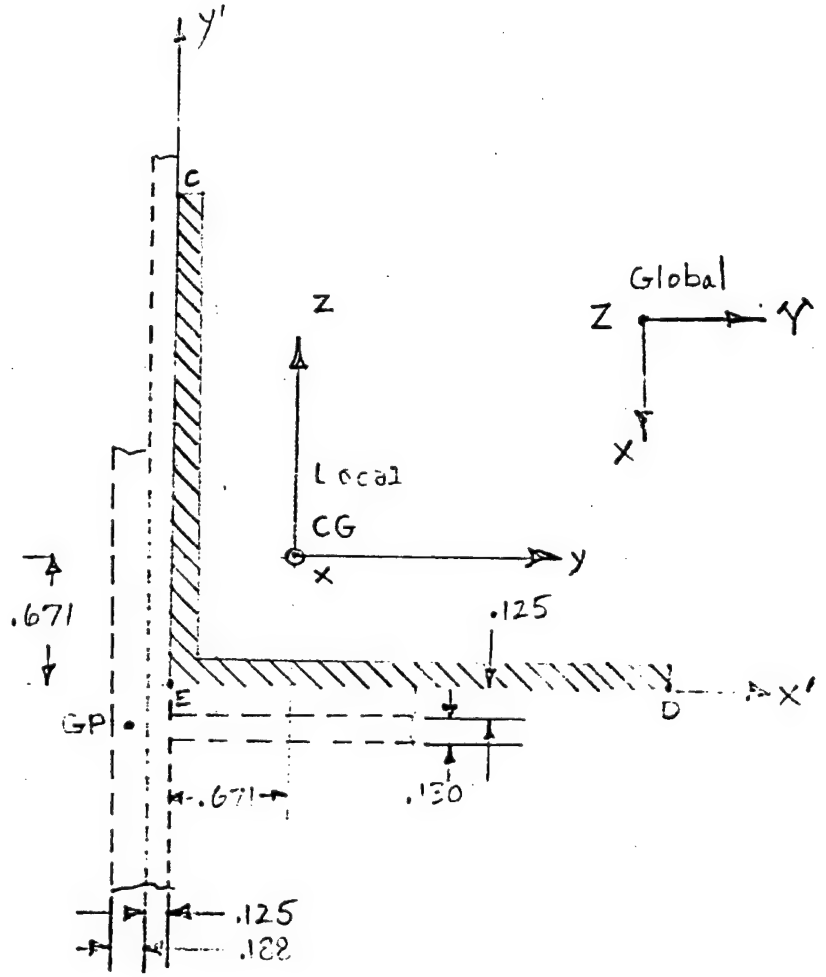
```
TOTAL AREA=                    .609E+00
X CENTROID DISTANCE=           .671E+00
Y CENTROID DISTANCE=           .671E+00
IX (ABOUT CENTROID)=           .378E+00
IY (ABOUT CENTROID)=           .378E+00
IXY (ABOUT CENTROID)=         -.226E+00
IMAX=                          .378E+00
IMIN=                          .378E+00
ALPHA=                         .900E+02
TORSIONAL CONSTANT, K=         .317E-02
IX (ABOUT INPUT AXIS)=         .653E+00        Y= 0.
IY (ABOUT INPUT AXIS)=         .653E+00        X= 0.
IXY (ABOUT INPUT AXIS)=        .488E-01

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 13

ELEMENT NUMBERS:
1603
1604
1607
1608
1609
1610
1613
1614

DESCRIPTION: Vertical tunnel members
($2\frac{1}{2}$x$2\frac{1}{2}$x$\frac{1}{8}$ angle, 2024-T-3)



PROPERTY NUMBER: 13

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	-.671	+1.829
D	+1.829	-.671
E	-.671	-.671

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
1603, 1604, 1607, 1608	-.861	+.890	0.0	-.861	+.890	0.0
1609, 1610, 1613, 1614	-.861	-.890	0.0	-.861	-.890	0.0

SHEAR FACTORS

$$K_1 = K_2 = \frac{(2.5)(\frac{1}{8})}{.609} = .513$$

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 13 VERTICAL MEMBERS OF TUNNEL (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	2.37500	.12500	0.00000	0.00000	1.31250	0.00000	0.00000
RECT	0.00	.12500	2.50000	0.00000	0.00000	.06250	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.29688	1.31250	.06250	.00039	.13955	0.00000	.00155
2	.31250	.06250	1.25000	.16276	.00041	0.00000	.00163

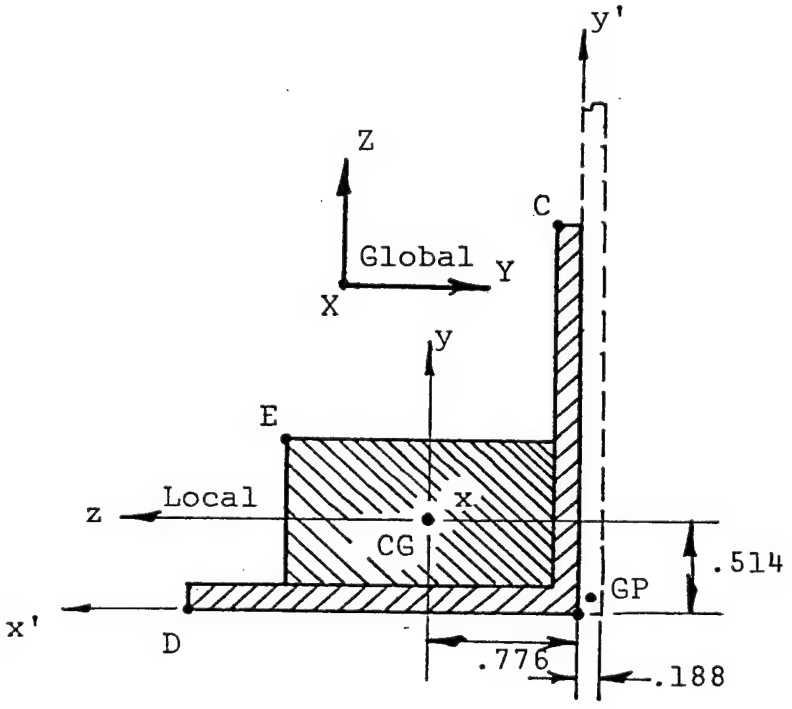
```
*****
*****   TOTAL AREA=                  .609E+00
*****   X CENTROID DISTANCE=         .671E+00
*****   Y CENTROID DISTANCE=         .671E+00
*****   IX (ABOUT CENTROID)=         .378E+00
*****   IY (ABOUT CENTROID)=         .378E+00
*****   IXY (ABOUT CENTROID)=       -.226E+00
*****   IMAX=                        .378E+00
*****   IMIN=                        .378E+00
*****   ALPHA=                       .900E+02
*****   TORSIONAL CONSTANT, K=       .317E-02
*****   IX (ABOUT INPUT AXIS)=       .653E+00      Y= 0.
*****   IY (ABOUT INPUT AXIS)=       .653E+00      X= 0.
*****   IXY (ABOUT INPUT AXIS)=      .488E-01
*****
*****   TORSIONAL CONSTANT BASED ON SUM
*****         NOT NECESSARILY ACCURATE
*****
```

STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 15

ELEMENT NUMBERS: 3005
3008
3017
3020
3095-3098

DESCRIPTION: Horizontal tunnel member on bottom on pallet
(2 x 2 x $\frac{1}{8}$ angle $\frac{3}{4}$ x $1\frac{1}{2}$ bar Al 2024-T3)



PROPERTY NUMBER: 15 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	1.486	-.776
D	-.514	1.224
E	.361	.849
F	-.514	-.776

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
3005, 3008, 3095, 3096	0.	-.870	+.4515	0.	-.870	+.4515
3017, 3020, 3097, 3098	0.	+.870	+.4515	0.	+.870	+.4515

SHEAR FACTORS

$$K_1 = K_2 = \frac{(\frac{3}{4})(1.5)+2(\frac{1}{8})}{1.61} = .854$$

INERTIA

BAR PROPERTY NUMBER

DESCRIPTION- PID NO 15 HORIZONTAL MEMBER OF TUNNEL (RACK PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.87500	.12500	0.00000	0.00000	1.06250	0.00000	0.00000
RECT	0.00	.12500	2.00000	0.00000	0.00000	.06250	0.00000	0.00000
RECT	0.00	1.50000	.75000	0.00000	0.00000	.87500	.12500	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.23438	1.06250	.06250	.00031	.06866	0.00000	.00122
2	.25000	.06250	1.00000	.08333	.00033	0.00000	.00130
3	1.12500	.87500	.50000	.05273	.21094	0.00000	.21094

```
**********************************************************************************************************
*****                                                                                                 *****
*****    TOTAL AREA=                  .161E+01                                                        *****
*****    X CENTROID DISTANCE=         .776E+00                                                        *****
*****    Y CENTROID DISTANCE=         .514E+00                                                        *****
*****    IX (ABOUT CENTROID)=         .243E+00                                                        *****
*****    IY (ABOUT CENTROID)=         .437E+00                                                        *****
*****    IXY (ABOUT CENTROID)=       -.119E+00                                                        *****
*****    IMAX=                        .494E+00                                                        *****
*****    IMIN=                        .187E+00                                                        *****
*****    ALPHA=                       .155E+03                                                        *****
*****    TORSIONAL CONSTANT, K=       .213E+00                                                        *****
*****    IX (ABOUT INPUT AXIS)=       .669E+00          Y= 0.                                         *****
*****    IY (ABOUT INPUT AXIS)=       .141E+01          X= 0.                                         *****
*****    IXY (ABOUT INPUT AXIS)=      .523E+00                                                        *****
*****                                                                                                 *****
*****    TORSIONAL CONSTANT BASED ON SUM                                                              *****
*****           NOT NECESSARILY ACCURATE                                                              *****
*****                                                                                                 *****
*****                                                                                                 *****
*****                                                                                                 *****
*****                                                                                                 *****
*****                                                                                                 *****
*****                                                                                                 *****
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*****                                                                                                 *****
*****                                                                                                 *****
*****                                                                                                 *****
**********************************************************************************************************
```
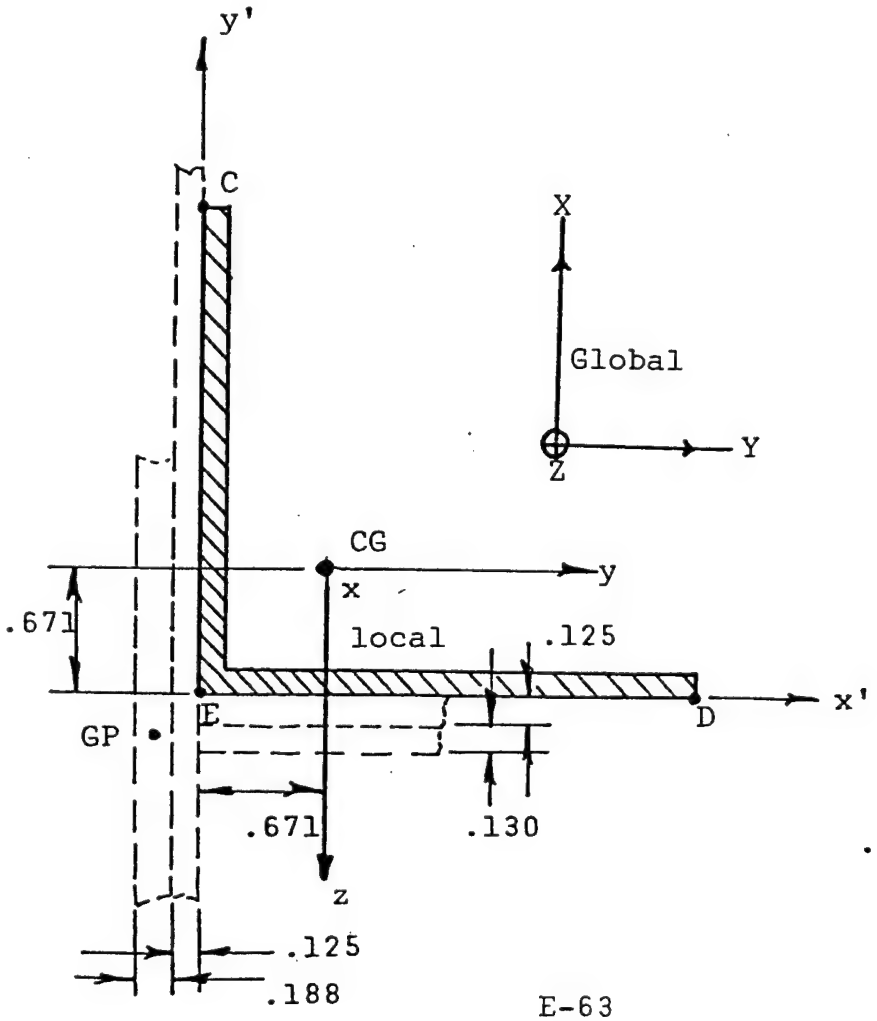

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 15

ELEMENT NUMBERS:

1601
1602
1605
1606
1611
1612
1615
1616

DESCRIPTION: Vertical tunnel members
($2\frac{1}{2}$ x $2\frac{1}{2}$ x $\frac{1}{8}$ angle, 2024-T3)



PROPERTY NUMBER: 15 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	-.671	-1.829
D	1.829	+.671
E	-.671	+.671

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
1601, 1602, 1605, 1606	-.861	+.890	0.0	-.861	+.890	0.0
1611, 1612, 1615, 1616	+.861	-.890	0.0	+.861	-.890	0.0

SHEAR FACTORS

$$K_1 = K_2 = \frac{(2.5)(\frac{1}{8})}{.609} = .513$$

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 15 VERTICAL MEMBERS OF TUNNEL (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	2.37500	.12500	0.00000	0.00000	1.31250	0.00000	0.00000
RECT	0.00	.12500	2.50000	0.00000	0.00000	.06250	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.29688	1.31250	.06250	.00039	.13955	0.00000	.00155
2	.31250	.06250	1.25000	.16276	.00041	0.00000	.00163

```
*****
*****   TOTAL AREA=                  .609E+00
*****   X CENTROID DISTANCE=         .671E+00
*****   Y CENTROID DISTANCE=         .671E+00
*****   IX (ABOUT CENTROID)=         .378E+00
*****   IY (ABOUT CENTROID)=         .378E+00
*****   IXY (ABOUT CENTROID)=       -.226E+00
*****   IMAX=                        .378E+00
*****   IMIN=                        .378E+00
*****   ALPHA=                       .900E+02
*****   TORSIONAL CONSTANT, K=       .317E-02
*****   IX (ABOUT INPUT AXIS)=       .653E+00        Y= 0.
*****   IY (ABOUT INPUT AXIS)=       .653E+00        X= 0.
*****   IXY (ABOUT INPUT AXIS)=      .488E-01
*****
*****   TORSIONAL CONSTANT BASED ON SUM
*****          NOT NECESSARILY ACCURATE
```

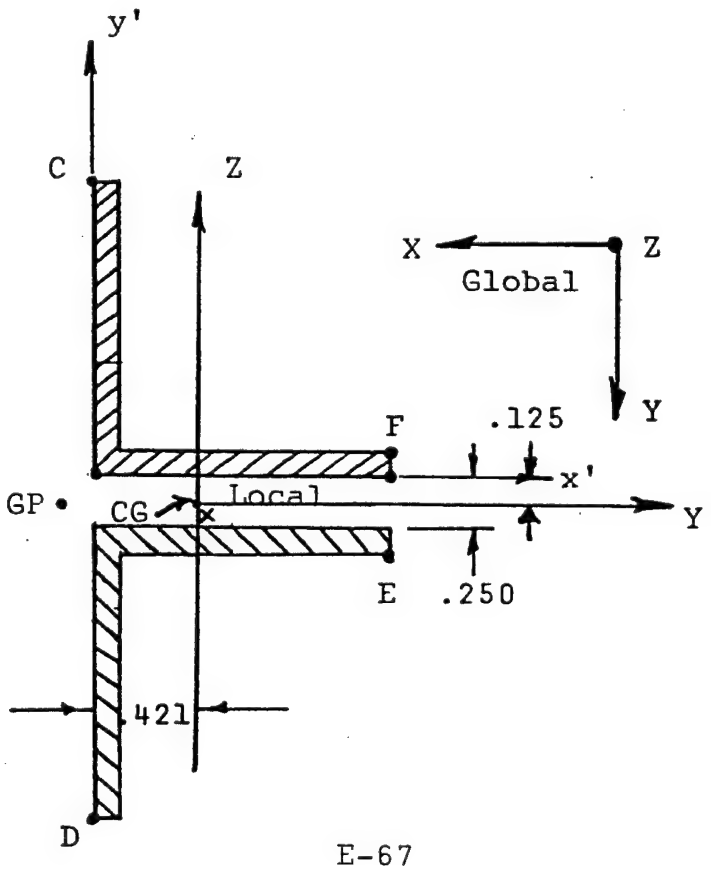
STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 16

ELEMENT NUMBERS: 3594
3595
3597
3598
3605
3606
3608
3609

DESCRIPTION: Clip between lower and upper plate at fork lift tunnel

(1.5 x 1.5 x $\frac{1}{8}$ angle Al 2024-T3)



PROPERTY NUMBER: 16 (continued)

CALCULATIONS:

See INERTIA program output on following page. Data shown here is for 2 clip system.

STRESS RECOVERY POINTS

Point	y	z
C	-.421	+1.625
D	-.421	-1.625
E	+1.079	-.25
F	+1.079	+.25

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
3594	0.	0.	0.	+2.000	0.	0.
3595	0.	0.	0.	-.410	0.	0.
3597	0.	0.	0.	-3.810	0.	0.
3598	0.	0.	0.	0.	0.	0.
3605	0.	0.	0.	+2.000	0.	0.
3606	0.	0.	0.	-.410	0.	0.
3608	0.	0.	0.	-3.820	0.	0.
3609	0.	0.	0.	0.	0.	0.

SHEAR FACTORS

$$K_1 = K_2 = \frac{(1.5)(\frac{1}{8})}{.359} = .521$$

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 16 CLIP, PN 13 (RACK PALLET 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.12500	1.50000	0.00000	0.00000	.06250	0.00000	0.00000
RECT	0.00	1.37500	.12500	0.00000	0.00000	.81250	0.00000	0.00000
RECT	0.00	1.37500	.12500	0.00000	0.00000	.81250	-.25000	0.00000
RECT	0.00	.12500	1.50000	0.00000	0.00000	.06250	-.25000	180.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.18750	.06250	.75000	.03516	.00024	0.00000	.00098
2	.17188	.81250	.06250	.00022	.02708	0.00000	.00090
3	.17188	.81250	-.18750	.00022	.02708	0.00000	.00090
4	.18750	.06249	-1.00000	.03516	.00024	-.00000	.00098

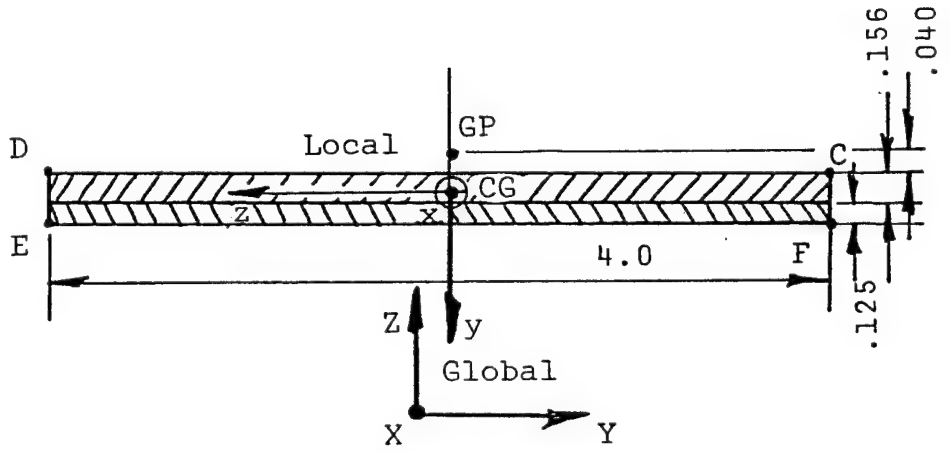
```
*****
*****    TOTAL AREA=                    .719E+00
*****    X CENTROID DISTANCE=           .421E+00
*****    Y CENTROID DISTANCE=          -.951E-01
*****    IX (ABOUT CENTROID)=           .364E+00
*****    IY (ABOUT CENTROID)=           .156E+00
*****    IXY (ABOUT CENTROID)=          .841E-02
*****    IMAX=                          .364E+00
*****    IMIN=                          .155E+00
*****    ALPHA=                        -.231E+01
*****    TORSIONAL CONSTANT, K=         .374E-02
*****    IX (ABOUT INPUT AXIS)=         .370E+00      Y= 0.
*****    IY (ABOUT INPUT AXIS)=         .283E+00      X= 0.
*****    IXY (ABOUT INPUT AXIS)=       -.204E-01
*****
*****    TORSIONAL CONSTANT BASED ON SUM
*****          NOT NECESSARILY ACCURATE
```

STRUCTURE: Rack Pallet 75-0010

PROPERTY NUMBER: 17

ELEMENT NUMBERS: 4059
4060
4064
4065
4076
4077
4081
4082

DESCRIPTION: Rack support beam above tunnel
(.156 x 4 bar Al 2024-T3)



PROPERTY NUMBER: 17 (continued)

CALCULATIONS:

$$I_y \text{ (about GP)} = \frac{bh^3}{12} + Ad^2$$

$$= \frac{(4)(.281)^3}{12} + (4)(.281)(\frac{.281}{2}+.04)^2 = .044$$

$$I_x \text{ (about GP)} = \frac{bh^3}{12} = \frac{(.281)(4.)^3}{12} = 1.4987$$

$$I_{xy} = 0$$

$$K = \frac{1}{3}ct^3 = \frac{1}{3}(4)(.281)^3 = .0296$$

$$A = (4)(.281) = 1.124$$

STRESS RECOVERY POINTS

Point	y	z
C	-.1405	-2.000
D	-.1405	+2.000
E	+.1405	+2.000
F	+.1405	-2.000

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B

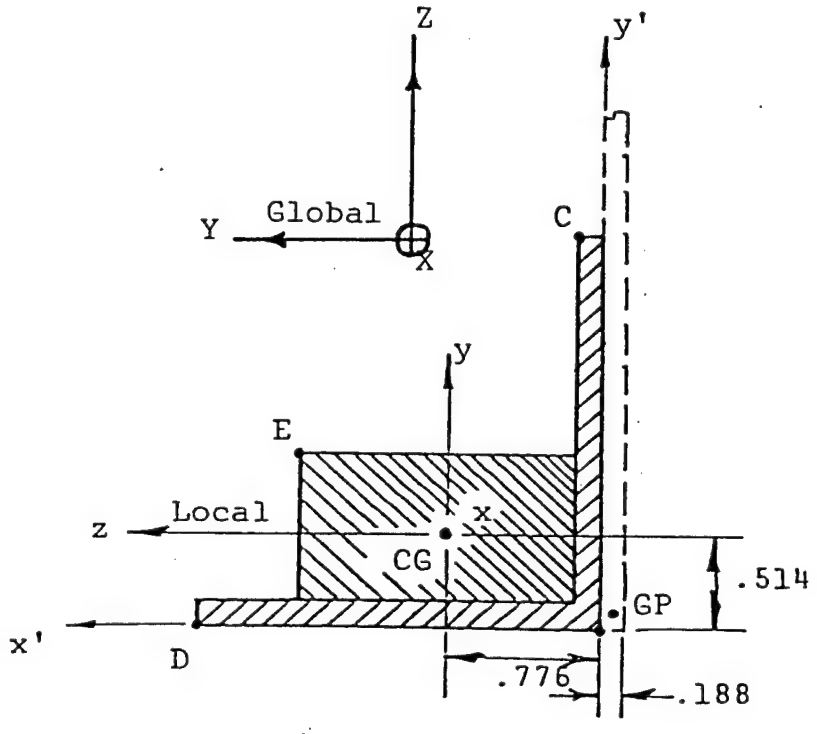
None

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 17

ELEMENT NUMBERS: 1005
1008
1017
1020
1095-1098

DESCRIPTION: Horizontal tunnel member on bottom of pallet
(2 x 2 x $\frac{1}{8}$ angle with $\frac{3}{4}$ x $1\frac{1}{2}$ bar, Al 2024-T3)



PROPERTY NUMBER: 17 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	1.486	-.776
D	-.514	1.224
E	.361	.849
F	-.514	-.776

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
1005, 1008, 1095, 1096	0.	+.870	+.4515	0.	+.870	+.4515
1017, 1020, 1097, 1098	0.	-.870	+.4515	0.	-.870	+.4515

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 17 HORIZONTAL MEMBER OF TUNNEL (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.87500	.12500	0.00000	0.00000	1.06250	0.00000	0.00000
RECT	0.00	.12500	2.00000	0.00000	0.00000	.06250	0.00000	0.00000
RECT	0.00	1.50000	.75000	0.00000	0.00000	.87500	.12500	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.23438	1.06250	.06250	.00031	.06866	0.00000	.00122
2	.25000	.06250	1.00000	.08333	.00033	0.00000	.00130
3	1.12500	.87500	.50000	.05273	.21094	0.00000	.21094

```
*****
*****   TOTAL AREA=                  .161E+01
*****   X CENTROID DISTANCE=         .776E+00
*****   Y CENTROID DISTANCE=         .514E+00
*****   IX (ABOUT CENTROID)=         .243E+00
*****   IY (ABOUT CENTROID)=         .437E+00
*****   IXY (ABOUT CENTROID)=       -.119E+00
*****   IMAX=                        .494E+00
*****   IMIN=                        .187E+00
*****   ALPHA=                       .155E+03
*****   TORSIONAL CONSTANT, K=       .213E+00
*****   IX (ABOUT INPUT AXIS)=       .669E+00        Y= 0.
*****   IY (ABOUT INPUT AXIS)=       .141E+01        X= 0.
*****   IXY (ABOUT INPUT AXIS)=      .523E+00
*****
*****   TORSIONAL CONSTANT BASED ON SUM
*****         NOT NECESSARILY ACCURATE
*****
```

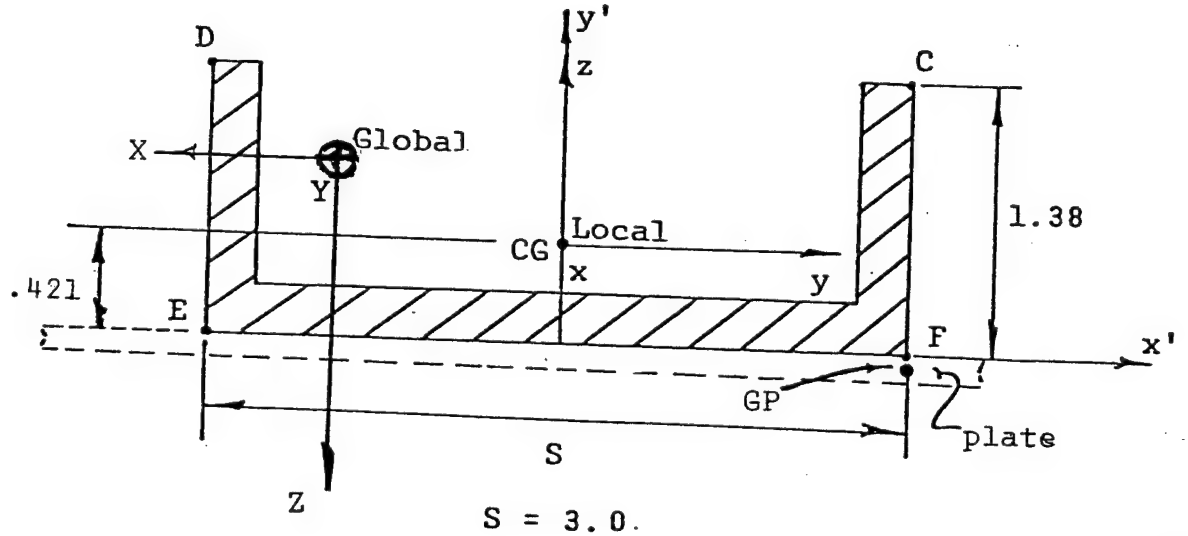
STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 18

ELEMENT NUMBERS: 2041
2046
2047
2052

DESCRIPTION: Seat Channel

(3.0 x 1.38 x $\frac{1}{4}$ channel, Al 2024-T3)



S = 3.0.

PROPERTY NUMBER: 18 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+1.500	+0.959
D	-1.500	+0.959
E	-1.500	-0.421
F	+1.500	-0.421

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2041 2046	+1.500	0.	-0.461	+1.500	0.	-0.461
2047 2052	-1.500	0.	-0.461	-1.500	0.	-0.461

SHEAR FACTORS

$$K_1 = \frac{(\frac{1}{4})(3)}{1.32} = .57$$

$$K_2 = \frac{2(1.38)(\frac{1}{4})}{1.32} = .52$$

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 18 SEAT CHANNELS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	2.50000	.25000	0.00000	0.00000	0.00000	0.00000	0.00000
RECT	0.00	.25000	1.38000	0.00000	0.00000	-1.37500	0.00000	0.00000
RECT	0.00	.25000	1.38000	0.00000	0.00000	1.37500	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.62500	0.00000	.12500	.00326	.32552	0.00000	.01302
2	.34500	-1.37500	.69000	.05475	.00180	0.00000	.00719
3	.34500	1.37500	.69000	.05475	.00180	0.00000	.00719

TOTAL AREA=	.132E+01	
X CENTROID DISTANCE=	0.	
Y CENTROID DISTANCE=	.421E+00	
IX (ABOUT CENTROID)=	.217E+00	
IY (ABOUT CENTROID)=	.163E+01	
IXY (ABOUT CENTROID)=	0.	
IMAX=	.163E+01	
IMIN=	.217E+00	
ALPHA=	-.180E+03	
TORSIONAL CONSTANT, K=	.274E-01	
IX (ABOUT INPUT AXIS)=	.451E+00	Y= 0.
IY (ABOUT INPUT AXIS)=	.163E+01	X= 0.
IXY (ABOUT INPUT AXIS)=	0.	

TORSIONAL CONSTANT BASED ON SUM
NOT NECESSARILY ACCURATE

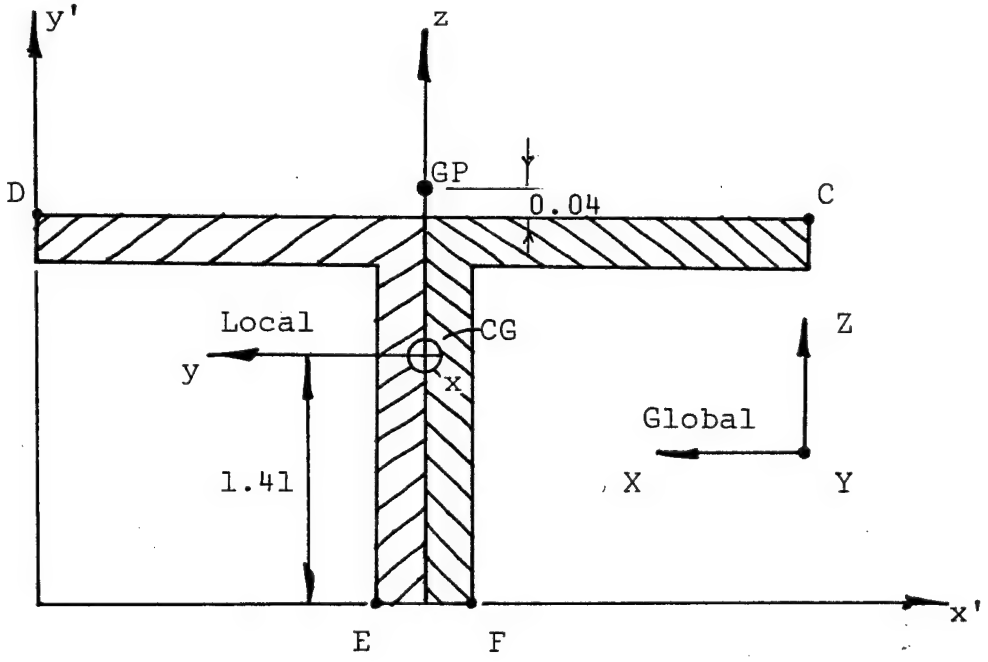
STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 26

ELEMENT NUMBERS: 2071-2094

DESCRIPTION: Top plate support angles

(2 x 2 x $\frac{1}{4}$ angles, Al 2024-T3)



PROPERTY NUMBER: 26 (continued)

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	-2.000	+.590
D	+2.000	+.590
E	+2.000	-1.410
F	-2.000	-1.410

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2071-2094	0.	0.	-.630	0.	0.	-.630

SHEAR FACTORS

$$K_1 = \frac{(\frac{1}{4})(4)}{1.88} = .532$$

$$K_2 = \frac{2(\frac{1}{4})(1.75)}{1.88} = .465$$

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 26 TOP PLATE SUPPORT ANGLES (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.25000	2.00000	0.00000	0.00000	1.87500	0.00000	0.00000
RECT	0.00	.25000	2.00000	0.00000	0.00000	2.12500	0.00000	0.00000
RECT	0.00	1.75000	.25000	0.00000	0.00000	.87500	1.75000	0.00000
RECT	0.00	1.75000	.25000	0.00000	0.00000	3.12500	1.75000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.50000	1.87500	1.00000	.16667	.00260	0.00000	.01042
2	.50000	2.12500	1.00000	.16667	.00260	0.00000	.01042
3	.43750	.87500	1.87500	.00228	.11165	0.00000	.00911
4	.43750	3.12500	1.87500	.00228	.11165	0.00000	.00911

TOTAL AREA=	.188E+01		
X CENTROID DISTANCE=	.200E+01		
Y CENTROID DISTANCE=	.141E+01		
IX (ABOUT CENTROID)=	.695E+00		
IY (ABOUT CENTROID)=	.135E+01		
IXY (ABOUT CENTROID)=	.284E-13		
IMAX=	.135E+01		
IMIN=	.695E+00		
ALPHA=	-.180E+03		
TORSIONAL CONSTANT, K=	.391E-01		
IX (ABOUT INPUT AXIS)=	.441E+01	Y= 0.	
IY (ABOUT INPUT AXIS)=	.885E+01	X= 0.	
IXY (ABOUT INPUT AXIS)=	.528E+01		

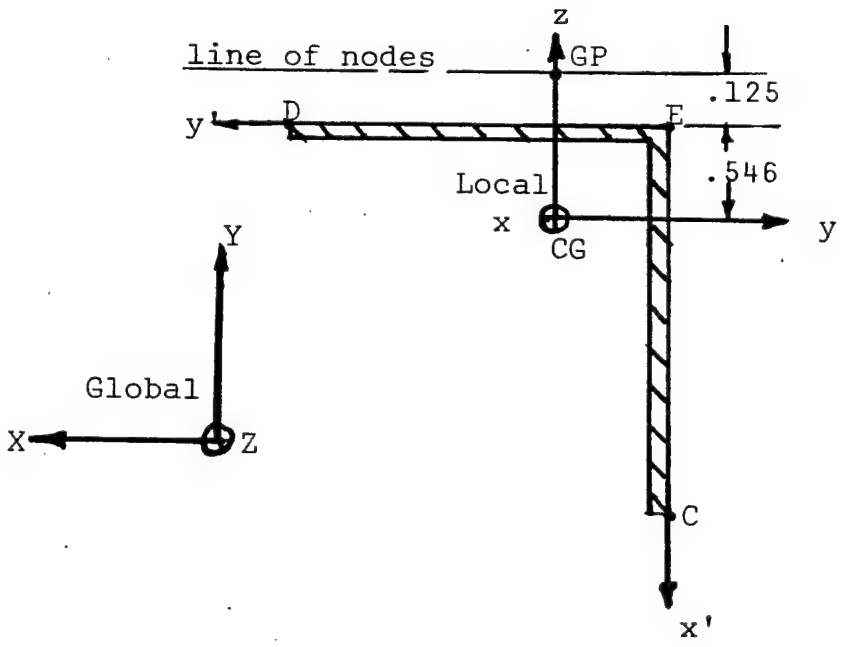
TORSIONAL CONSTANT BASED ON SUM
NOT NECESSARILY ACCURATE

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 32

ELEMENT NUMBERS: 2253-2255
2263
2267

DESCRIPTION: Vertical Members, AL 2024-T3
$2x2x\frac{1}{8}$ angle



PROPERTY NUMBER: 32

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+0.546	-1.454
D	-1.454	+0.546
E	+0.546	+0.546

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2253-2255, 2263, 2267	0.0	-.671	0.0	0.0	-.671	0.0

TOTAL AREA=	.484E+00	
X CENTROID DISTANCE=	.546E+00	
Y CENTROID DISTANCE=	.547E+00	
IX (ABOUT CENTROID)=	.190E+00	
IY (ABOUT CENTROID)=	.190E+00	
IXY (ABOUT CENTROID)=	-.113E+00	
IMAX=	.303E+00	
IMIN=	.766E-01	
ALPHA=	.450E+02	
TORSIONAL CONSTANT, K=	.252E-02	
IX (ABOUT INPUT AXIS)=	.335E+00	Y= 0.
IY (ABOUT INPUT AXIS)=	.335E+00	X= 0.
IXY (ABOUT INPUT AXIS)=	.312E-01	

TORSIONAL CONSTANT BASED ON SUM
NOT NECESSARILY ACCURATE

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 32 VERTICAL MEMBERS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.87500	.12500	0.00000	0.00000	.12500	1.06300	90.00000
RECT	0.00	2.00000	.12500	0.00000	0.00000	1.00000	0.00000	0.00000

OUTPUT

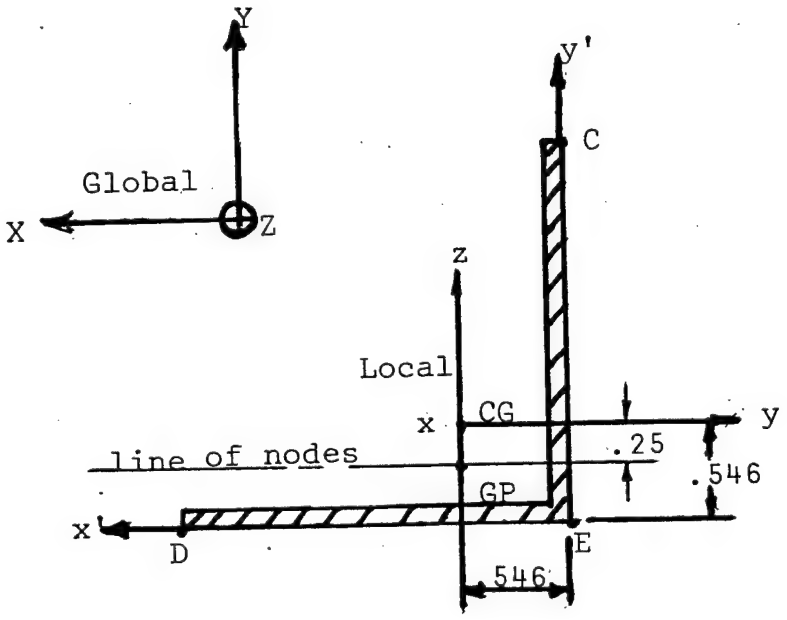
NO.	AREA	XC	YC	IX	IY	IXY	K
1	.23438	.06250	1.06300	.06866	.00031	-.00000	.00122
2	.25000	1.00000	.06250	.00033	.08333	0.00000	.00130

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 33

ELEMENT NUMBERS: 2246-2248
2262
2266

DESCRIPTION: Vertical members (2x2x$\frac{1}{8}$ angle)
AL 2024-T3



PROPERTY NUMBER: 33

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+.546	+1.454
D	-1.454	- .546
E	+ .546	- .546

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2246-2248, 2262, 2266	0.0	+.25	0.0	0.0	+.25	0.0

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO. 33 VERTICAL MEMBERS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.87500	.12500	0.00000	0.00000	.12500	1.06300	90.00000
RECT	0.00	2.00000	.12500	0.00000	0.00000	1.00000	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.23438	.06250	1.06300	.06866	.00031	-.00000	.00122
2	.25000	1.00000	.06250	.00033	.08333	0.00000	.00130

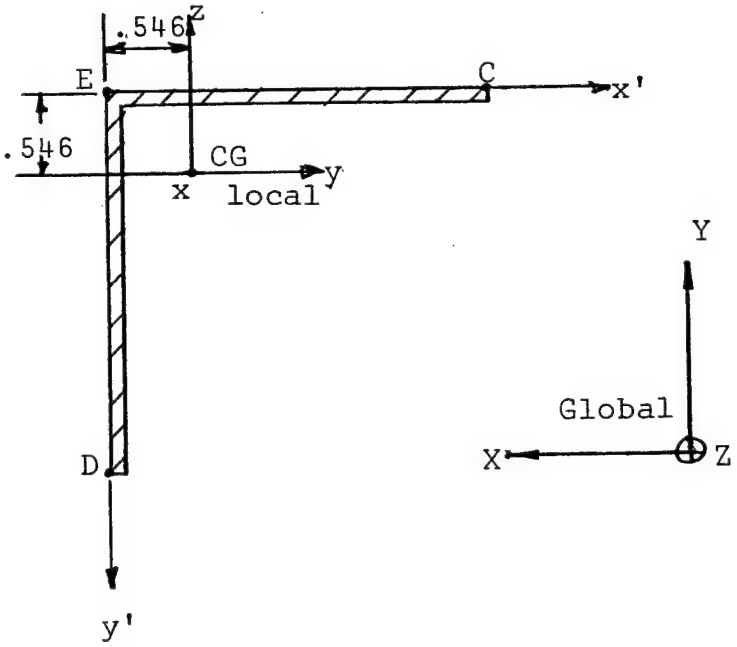
```
TOTAL AREA=                    .484E+00
X CENTROID DISTANCE=           .546E+00
Y CENTROID DISTANCE=           .547E+00
IX (ABOUT CENTROID)=           .190E+00
IY (ABOUT CENTROID)=           .190E+00
IXY (ABOUT CENTROID)=         -.113E+00
IMAX=                          .303E+00
IMIN=                          .766E-01
ALPHA=                         .450E+02
TORSIONAL CONSTANT, K=         .252E-02
IX (ABOUT INPUT AXIS)=         .335E+00          Y= 0.
IY (ABOUT INPUT AXIS)=         .335E+00          X= 0.
IXY (ABOUT INPUT AXIS)=        .312E-01

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 35

ELEMENT NUMBERS: 2251-2252
2261
2265

DESCRIPTION: Vertical members (2 x 2 x $\frac{1}{8}$ angle)
AL 2024-T3



PROPERTY NUMBER: 35

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+1.454	+0.546
D	-0.546	-1.454
E	-0.546	-0.546

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2251-2252 2261 2265	-1.155	-.671	0.0	-1.155	-.671	0.0

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO. 35 VERTICAL MEMBERS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.87500	.12500	0.00000	0.00000	.12500	1.06300	90.00000
RECT	0.00	2.00000	.12500	0.00000	0.00000	1.00000	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.23438	.06250	1.06300	.06866	.00031	-.00000	.00122
2	.25000	1.00000	.06250	.00033	.08333	0.00000	.00130

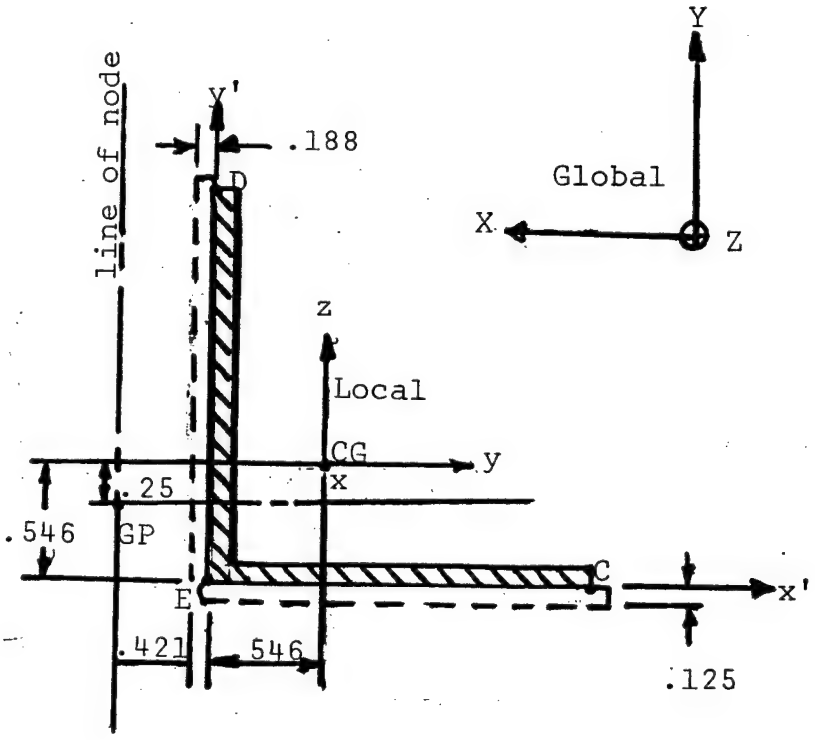
```
TOTAL AREA=                    .484E+00
X CENTROID DISTANCE=           .546E+00
Y CENTROID DISTANCE=           .547E+00
IX (ABOUT CENTROID)=           .190E+00
IY (ABOUT CENTROID)=           .190E+00
IXY (ABOUT CENTROID)=         -.113E+00
IMAX=                          .303E+00
IMIN=                          .766E-01
ALPHA=                         .450E+02
TORSIONAL CONSTANT, K=         .252E-02
IX (ABOUT INPUT AXIS)=         .335E+00          Y= 0.
IY (ABOUT INPUT AXIS)=         .335E+00          X= 0.
IXY (ABOUT INPUT AXIS)=        .312E-01

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

STRUCTURE: Seat Pallet
75-0010

PROPERTY NUMBER: 36

ELEMENT NUMBERS: 2244-2245
2260
2264

DESCRIPTION: Vertical members (2 x 2 x $\frac{1}{8}$ angle)
AL 2024-T3



PROPERTY NUMBER: 36

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+1.454	-.546
D	- .546	+1.454
E	- .546	-.546

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2244-2245						
2260	-1.155	.250	0.0	-1.155	.250	0.0
2264						

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID 36 VERTICAL MEMBERS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.87500	.12500	0.00000	0.00000	.12500	1.06300	90.00000
RECT	0.00	2.00000	.12500	0.00000	0.00000	1.00000	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.23438	.06250	1.06300	.06866	.00031	-.00000	.00122
2	.25000	1.00000	.06250	.00033	.08333	0.00000	.00130

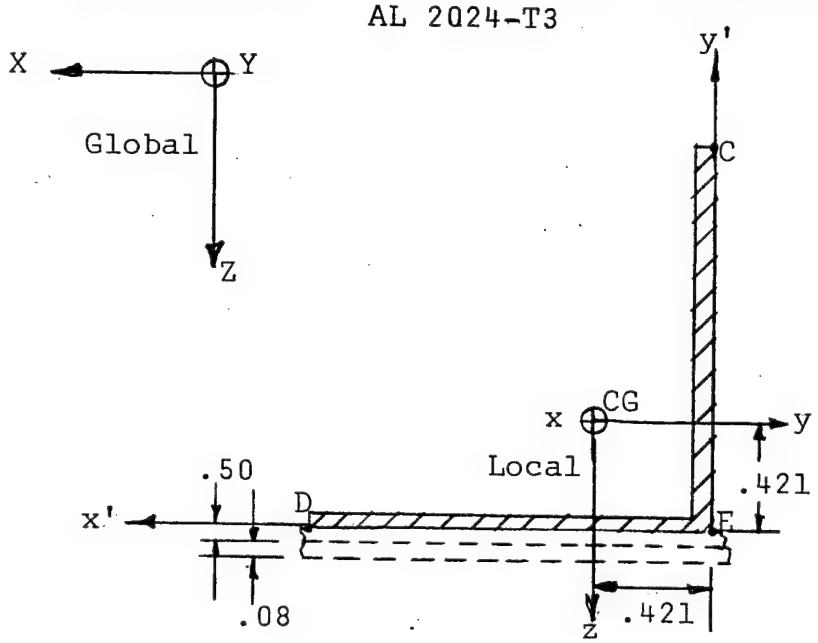
```
TOTAL AREA=                      .484E+00
X CENTROID DISTANCE=             .546E+00
Y CENTROID DISTANCE=             .547E+00
IX (ABOUT CENTROID)=             .190E+00
IY (ABOUT CENTROID)=             .190E+00
IXY (ABOUT CENTROID)=           -.113E+00
IMAX=                            .303E+00
IMIN=                            .766E-01
ALPHA=                           .450E+02
TORSIONAL CONSTANT, K=           .252E-02
IX (ABOUT INPUT AXIS)=           .335E+00          Y= 0.
IY (ABOUT INPUT AXIS)=           .335E+00          X= 0.
IXY (ABOUT INPUT AXIS)=          .312E-01

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 42

ELEMENT NUMBERS: 2201-2206

DESCRIPTION: BOTTOM HORIZONTAL MEMBERS ($1\frac{1}{2}$x$1\frac{1}{2}$x$\frac{1}{8}$ angle) AL 2024-T3



PROPERTY NUMBER: 42

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+ .421	-1.079
D	-1.079	+ .421
E	+ .421	+ .421

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2201-2206	0.0	0.0	-.961	0.0	0.0	-.961

INERTIA

BAR PROPERTY NUMBER

DESCRIPTION- PID NO. 42 BOTTOM HORIZONTAL MEMBERS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.37500	.12500	0.00000	0.00000	.81250	0.00000	0.00000
RECT	0.00	.12500	1.50000	0.00000	0.00000	.06250	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.17188	.81250	.06250	.00022	.02708	0.00000	.00090
2	.18750	.06250	.75000	.03516	.00024	0.00000	.00098

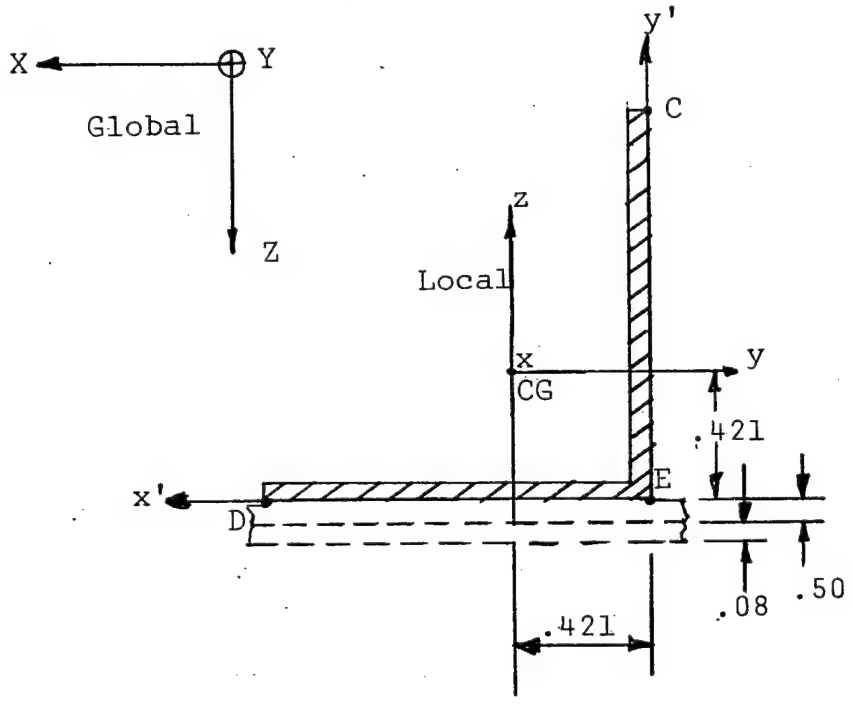
```
TOTAL AREA=                    .359E+00
X CENTROID DISTANCE=           .421E+00
Y CENTROID DISTANCE=           .421E+00
IX (ABOUT CENTROID)=           .778E-01
IY (ABOUT CENTROID)=           .778E-01
IXY (ABOUT CENTROID)=         -.462E-01
IMAX=                          .778E-01
IMIN=                          .362E-01
ALPHA=                         .900E+02
TORSIONAL CONSTANT, K=         .187E-02
IX (ABOUT INPUT AXIS)=         .142E+00          Y= 0.
IY (ABOUT INPUT AXIS)=         .142E+00          X= 0.
IXY (ABOUT INPUT AXIS)=        .175E-01

TORSIONAL CONSTANT BASED ON SUM
       NOT NECESSARILY ACCURATE
```

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 43

ELEMENT NUMBERS: 2207-2209
2211
2216

DESCRIPTION: Horizontal members ($1\frac{1}{2}x1\frac{1}{2}x\frac{1}{8}$ angle)
AL 2024-T3



PROPERTY NUMBER: 43

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+.421	+1.079
D	-1.079	- .421
E	+.421	- .421

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2207-2209	0.0	0.0	-.961	0.0	0.0	-.961
2211	0.0	0.0	0.0	0.0	0.0	0.0
2216	0.0	0.0	+.484	0.0	0.0	+.484

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- P.I.D. NO. 43 HORIZONTAL MEMBERS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.37500	.12500	0.00000	0.00000	.81250	0.00000	0.00000
RECT	0.00	.12500	1.50000	0.00000	0.00000	.06250	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.17188	.81250	.06250	.00022	.02708	0.00000	.00090
2	.18750	.06250	.75000	.03516	.00024	0.00000	.00098

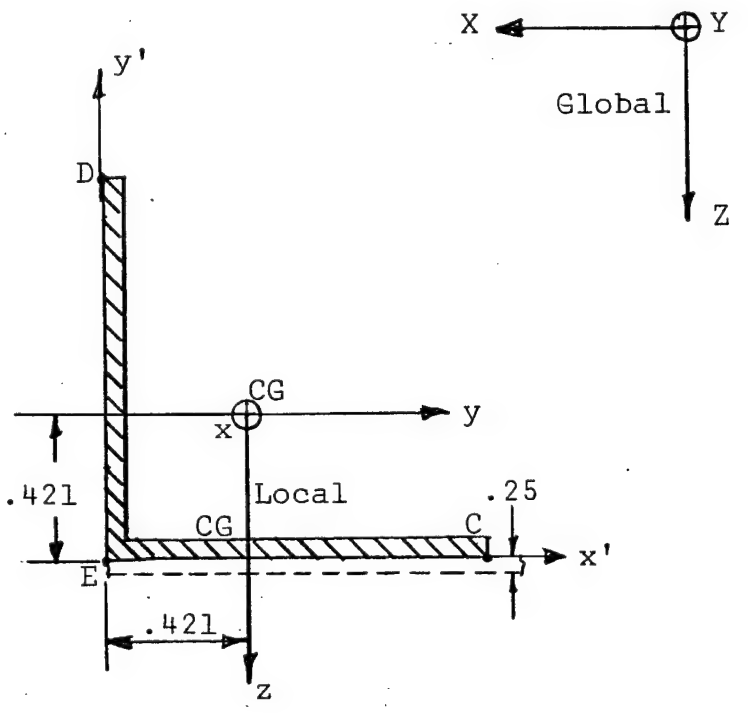
```
TOTAL AREA=                      .359E+00
X CENTROID DISTANCE=             .421E+00
Y CENTROID DISTANCE=             .421E+00
IX (ABOUT CENTROID)=             .778E-01
IY (ABOUT CENTROID)=             .778E-01
IXY (ABOUT CENTROID)=           -.462E-01
IMAX=                            .778E-01
IMIN=                            .362E-01
ALPHA=                           .900E+02
TORSIONAL CONSTANT, K=           .187E-02
IX (ABOUT INPUT AXIS)=           .142E+00            Y= 0.
IY (ABOUT INPUT AXIS)=           .142E+00            X= 0.
IXY (ABOUT INPUT AXIS)=          .175E-01

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 45

ELEMENT NUMBERS:
2213
2217
2223-2227
2229-2230
2232-2235
2240-2241
2249-2250
2258
2268

DESCRIPTION: Horizontal members ($1\frac{1}{2}$x$1\frac{1}{2}$x$\frac{1}{8}$ angle)
AL 2024-T3



PROPERTY NUMBER: 45

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+1.079	+ .421
D	- .421	-1.079
E	- .421	+ .421

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2213	0.0	0.0	0.0	0.0	0.0	0.0
2217	0.0	0.0	+.484	0.0	0.0	+.484
2223-2227	0.0	-.421	-.961	0.0	-.421	-.961
2229-2230	0.0	0.0	0.0	0.0	0.0	0.0
2232-2235	0.0	0.0	0.0	0.0	0.0	0.0
2240-2241	0.0	0.0	-.484	0.0	0.0	-.484
2249-2250	0.0	0.0	0.0	0.0	0.0	0.0
2258	0.0	-.125	0.0	0.0	-.125	0.0
2268	0.0	0.0	0.0	0.0	0.0	0.0

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID NO 45 HORIZONTAL MEMBERS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.37500	.12500	0.00000	0.00000	.81250	0.00000	0.00000
RECT	0.00	.12500	1.50000	0.00000	0.00000	.06250	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.17188	.81250	.06250	.00022	.02708	0.00000	.00090
2	.18750	.06250	.75000	.03516	.00024	0.00000	.00098

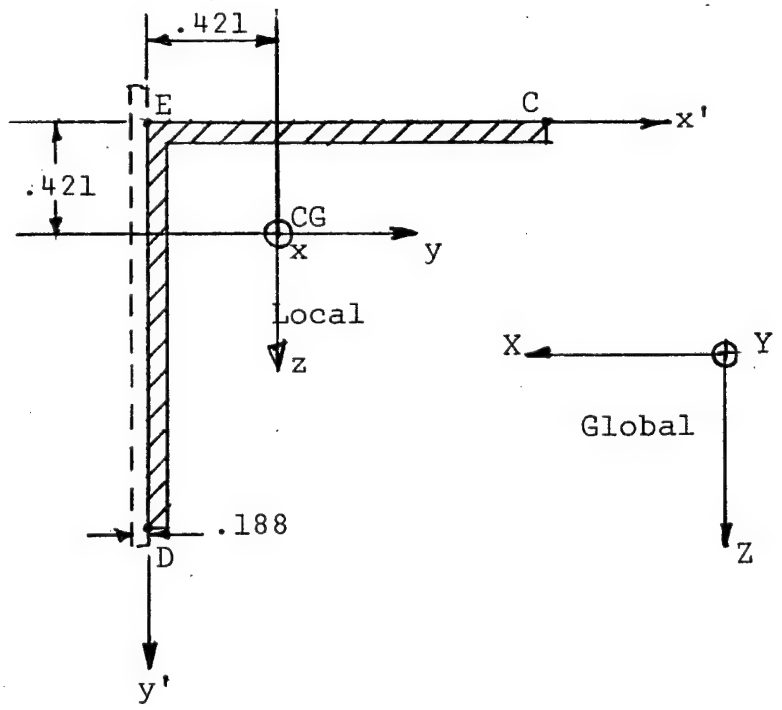
```
TOTAL AREA=                       .359E+00
X CENTROID DISTANCE=              .421E+00
Y CENTROID DISTANCE=              .421E+00
IX (ABOUT CENTROID)=              .778E-01
IY (ABOUT CENTROID)=              .778E-01
IXY (ABOUT CENTROID)=            -.462E-01
IMAX=                             .778E-01
IMIN=                             .362E-01
ALPHA=                            .900E+02
TORSIONAL CONSTANT, K=            .187E-02
IX (ABOUT INPUT AXIS)=            .142E+00          Y= 0.
IY (ABOUT INPUT AXIS)=            .142E+00          X= 0.
IXY (ABOUT INPUT AXIS)=           .175E-01

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

STRUCTURE: Seat Pallet 75-0010

PROPERTY NUMBER: 46

ELEMENT NUMBERS: 2210
2212
2215
2218-2222
2228
2231
2236-2239
2242-2243
2256-2257
2259

DESCRIPTION: Horizontal members ($1\frac{1}{2}$x$1\frac{1}{2}$x$\frac{1}{8}$ angle)
AL 2024-T3



PROPERTY NUMBER: 46

CALCULATIONS:

See INERTIA program output on following page.

STRESS RECOVERY POINTS

Point	y	z
C	+1.079	- .421
D	- .421	+1.079
E	- .421	- .421

OFFSET

CBAR Element No.	Z1A	Z2A	Z3A	Z1B	Z2B	Z3B
2210	-1.030	0.0	0.0	-1.030	0.0	0.0
2212	0.0	0.0	-1.092	0.0	0.0	-1.092
2215	-1.030	0.0	+.484	-1.030	0.0	+.484
2218-2222	0.0	0.0	-.961	0.0	0.0	-.961
2228	-.967	0.0	0.0	-.967	0.0	0.0
2231	0.0	-.421	0.0	0.0	-.421	0.0
2236-2239	-.421	0.0	0.0	-.421	0.0	0.0
2242-2243	-.421	0.0	-.484	-.421	0.0	-.484
2256-2257	0.0	-.546	0.0	0.0	-.546	0.0
2259	0.0	-.546	0.0	0.0	-.546	0.0

INERTIA

BAR PROPERTY NUMBER

DESCRIPTION- P.I.D. NO 46 HORIZONTAL MEMBERS (SEAT PALLET 75-0010)

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	1.37500	.12500	0.00000	0.00000	.81250	0.00000	0.00000
RECT	0.00	.12500	1.50000	0.00000	0.00000	.06250	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.17188	.81250	.06250	.00022	.02708	0.00000	.00090
2	.18750	.06250	.75000	.03516	.00024	0.00000	.00098

TOTAL AREA=	.359E+00	
X CENTROID DISTANCE=	.421E+00	
Y CENTROID DISTANCE=	.421E+00	
IX (ABOUT CENTROID)=	.778E-01	
IY (ABOUT CENTROID)=	.778E-01	
IXY (ABOUT CENTROID)=	-.462E-01	
IMAX=	.778E-01	
IMIN=	.362E-01	
ALPHA=	.900E+02	
TORSIONAL CONSTANT, K=	.187E-02	
IX (ABOUT INPUT AXIS)=	.142E+00	Y= 0.
IY (ABOUT INPUT AXIS)=	.142E+00	X= 0.
IXY (ABOUT INPUT AXIS)=	.175E-01	

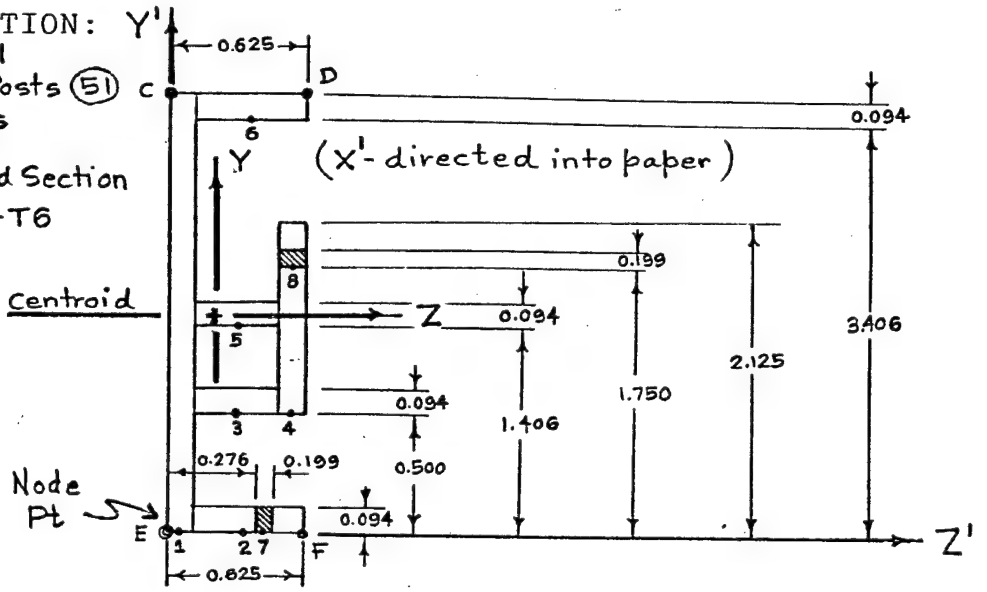
TORSIONAL CONSTANT BASED ON SUM
NOT NECESSARILY ACCURATE

PROPERTY NUMBER: PID 101 (Equipment Rack 75-0010)

ELEMENT NUMBERS: CBAR 201 thru 214
CBAR 330 thru 341
CBAR 284, 285
CBAR 293, 294

DESCRIPTION:
Vertical Corner Posts (51) on Dwgs

Extruded Section
AL6061-T6



C, D, E, F are NASTRAN stress output points (E also a Node Point)

CALCULATIONS:

The following information will be input to the INERTIA program from which section properties will be calculated for the above pictured cross-section.

Rectangle No.	Loc Pt Coordinates ** Z_i'	Y_i'	Basic Dimensions B_i	H_i
1	0.047	0.0	0.094	3.500
2	0.360	0.0	0.531	0.094
3	0.313	0.500	0.437	0.094
4	0.578	0.500	0.094	1.625
5	0.313	1.406	0.437	0.094
6	0.360	3.406	0.531	0.094
* 7	0.376	0.0	0.199	0.094
* 8	0.578	1.750	0.094	0.199

* Negative Areas
** "Z" corresponds to "X" in the INERTIA Program

INERTIA

WRITTEN BY ANAMET LABORATORIES
SAN CARLOS, CA.

BAR PROPERTY NUMBER
DESCRIPTION- PID 101 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.9400E-01	.3500E+010.	0.		.4700E-010.	0.	
RECT	0.00	.5310E+00	.9400E-010.	0.		.3600E+000.	0.	
RECT	0.00	.4370E+00	.9400E-010.	0.		.3130E+00	.5000E+000.	
RECT	0.00	.9400E-01	.1625E+010.	0.		.5780E+00	.5000E+000.	
RECT	0.00	.4370E+00	.9400E-010.	0.		.3130E+00	.1406E+010.	
RECT	0.00	.5310E+00	.9400E-010.	0.		.3600E+00	.3406E+010.	
RECT	-1.00	.1990E+00	.9400E-010.	0.		.3760E+000.	0.	
RECT	-1.00	.9400E-01	.1990E+000.	0.		.5780E+00	.1750E+010.	

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.329E+00	.470E-01	.175E+01	.336E+00	.242E-03	0.	.969E-03
2	.499E-01	.360E+00	.470E-01	.368E-04	.117E-02	0.	.147E-03
3	.411E-01	.313E+00	.547E+00	.302E-04	.654E-03	0.	.121E-03
4	.153E+00	.578E+00	.131E+01	.336E-01	.112E-03	0.	.450E-03
5	.411E-01	.313E+00	.145E+01	.302E-04	.654E-03	0.	.121E-03
6	.499E-01	.360E+00	.345E+01	.368E-04	.117E-02	0.	.147E-03
7	-.187E-01	.376E+00	.470E-01	-.138E-04	-.617E-04	0.	-.551E-04
8	-.187E-01	.578E+00	.185E+01	-.617E-04	-.138E-04	0.	-.551E-04

```
*****
*****
*****    TOTAL AREA=                  .626E+00
*****    X CENTROID DISTANCE=         .236E+00
*****    Y CENTROID DISTANCE=         .159E+01
*****    IX (ABOUT CENTROID)=         .681E+00
*****    IY (ABOUT CENTROID)=         .330E-01
*****    IXY (ABOUT CENTROID)=       -.238E-01
*****    IMAX=                        .682E+00
*****    IMIN=                        .321E-01
*****    ALPHA=                       .210E+01
*****    TORSIONAL CONSTANT, K=       .184E-02
*****    IX (ABOUT INPUT AXIS)=       .227E+01        Y= 0.
*****    IY (ABOUT INPUT AXIS)=       .678E-01        X= 0.
*****    IXY (ABOUT INPUT AXIS)=      .211E+00
*****
*****    TORSIONAL CONSTANT BASED ON SUM
*****          NOT NECESSARILY ACCURATE
```

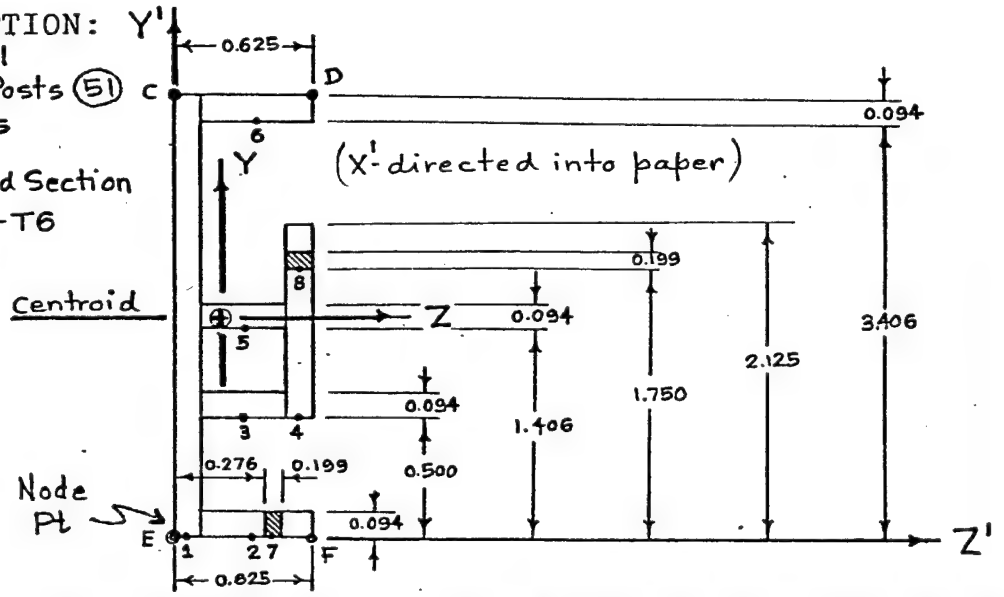
PROPERTY NUMBER: PID 101 (continued)

In order to specify how the beam elements are oriented w.r.t. the Basic Coordinate System, the cross-sections for each CBAR element are shown below with the Basic Coordinate directions indicated.

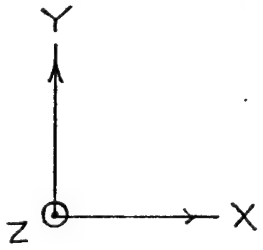
CBAR 201 thru 207, 284, 285

DESCRIPTION: Vertical Corner Posts (51) on Dwgs

Extruded Section AL6061-T6



C, D, E, F are NASTRAN stress output points (E also a Node Point)



Basic Coordinate Directions

Vector components for $\bar{v}$ will be;

$X_1 = 0.0 \quad Y_1 = 1.0 \quad Z_1 = -1.0$

(which will correspond to X1, X2, X3 on the CBAR card.)

Offsets will be:

$X_a = 0.236 \qquad X_b = 0.236$

$Y_a = 1.59 \qquad Y_b = 1.59$

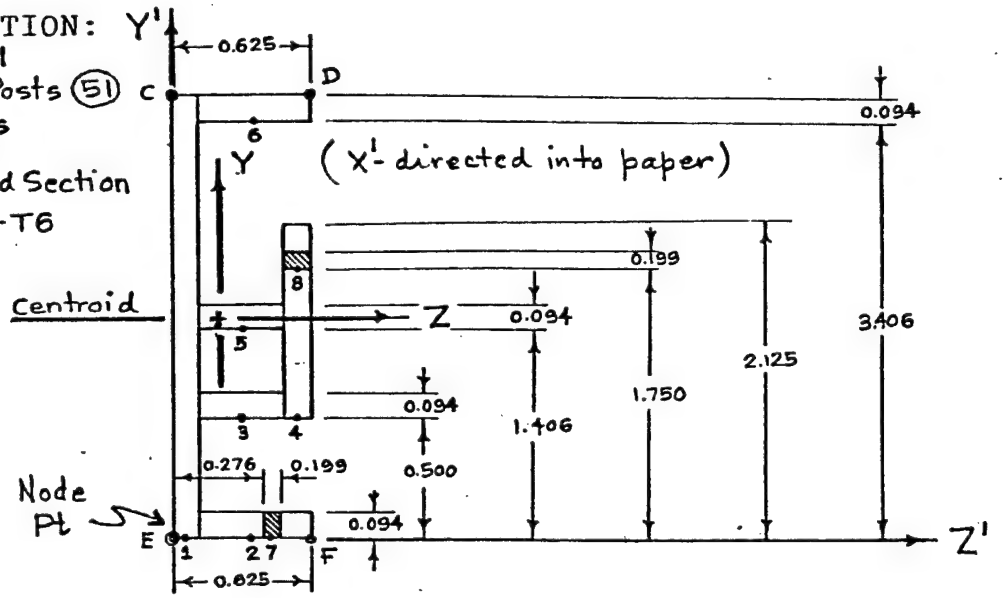
$Z_a = 0.0 \qquad Z_b = 0.0$

PROPERTY NUMBER: PID101 (continued)

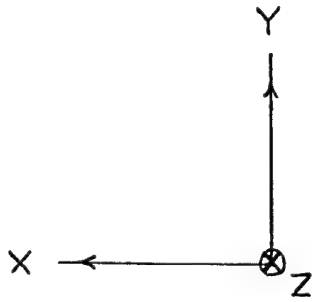
CBAR 208 thru 214

DESCRIPTION:
Vertical
Corner Posts (51)
on Dwgs

Extruded Section
AL6061-T6



C, D, E, F are NASTRAN stress output points (E also a Node Point)



Basic Coordinate Directions

Vector components for $\bar{v}$ will be:

$X_1 = 0.0$ $Y_1 = 1.0$ $Z_1 = 1.0$

(which correspond to X1, X2, X3 on the CBAR card)

Offsets will be:

$X_a = -0.236$ $X_b = -0.236$

$Y_a = 1.59$ $Y_b = 1.59$

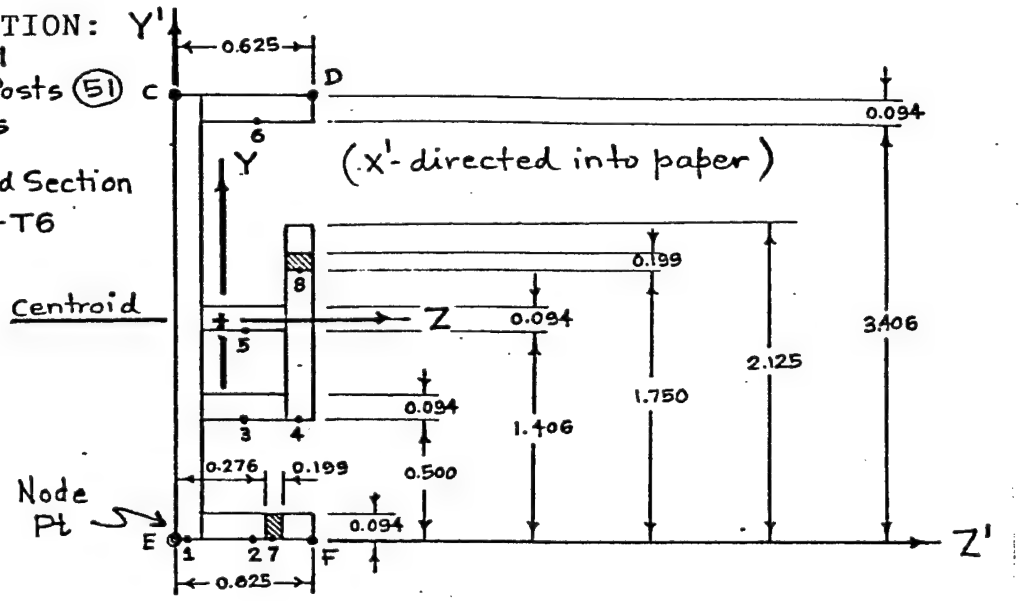
$Z_a = 0.0$ $Z_b = 0.0$

PROPERTY NUMBER: PID 101 (continued)

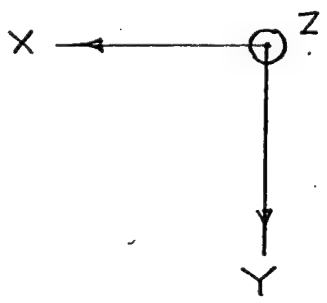
CBAR 330 thru 335

DESCRIPTION:
Vertical
Corner Posts (51)
on Dwgs

Extruded Section
AL6061-T6



C, D, E, F are NASTRAN stress output points (E also a Node Point)



Basic Coordinate Directions

Vector Components for $\bar{v}$ will be

$X_1 = 0.0$ $Y_1 = -1.0$ $Z_1 = -1.0$

(which correspond to X1, X2, X3 on CBAR card.)

offsets will be:

$X_a = -0.236$ $X_b = -0.236$

$Y_a = -1.59$ $Y_b = -1.59$

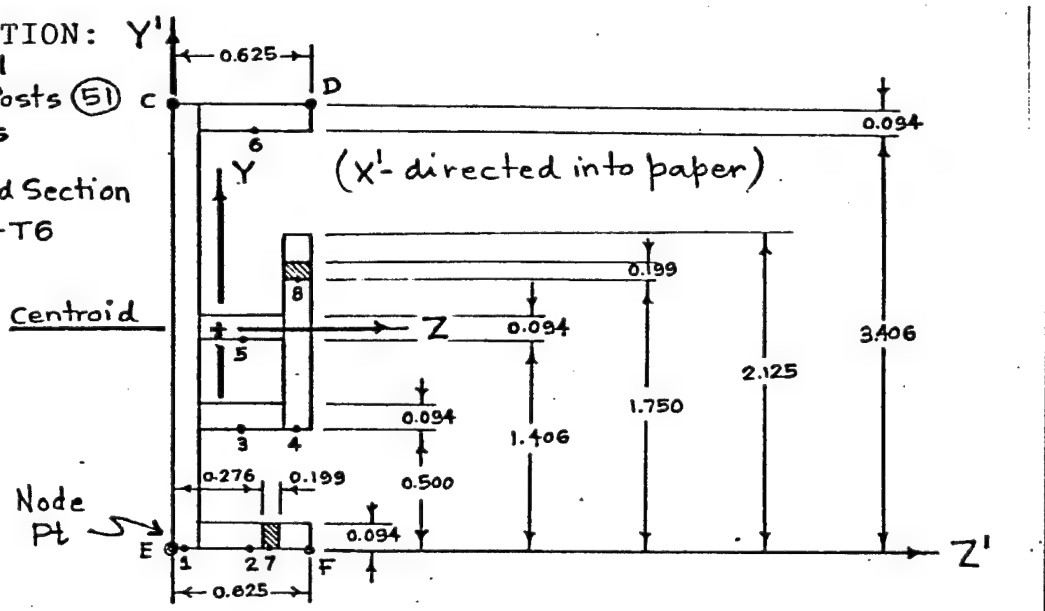
$Z_a = 0.0$ $Z_b = 0.0$

PROPERTY NUMBER: PID 101 (continued)

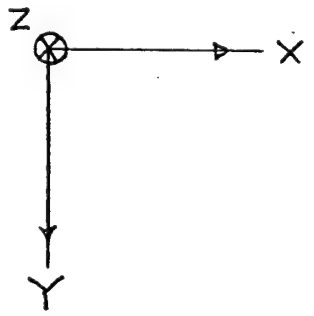
CBAR 336 thru 341, 293, 294

DESCRIPTION:
Vertical Corner Posts (51) on Dwgs

Extruded Section
AL6061-T6



C, D, E, F are NASTRAN stress output points (E also a Node Point)



Basic Coordinate Directions
Vector components for $\bar{V}$

$X_1 = 0.0 \quad Y_1 = -1.0 \quad Z_1 = 1.0$

(which correspond to X1, X2, X3 on CBAR card.)

Offsets will be

$X_a = 0.236$ $\quad X_b = 0.236$

$Y_a = -1.59$ $\quad Y_b = -1.59$

$Z_a = 0.0$ $\quad Z_b = 0.0$

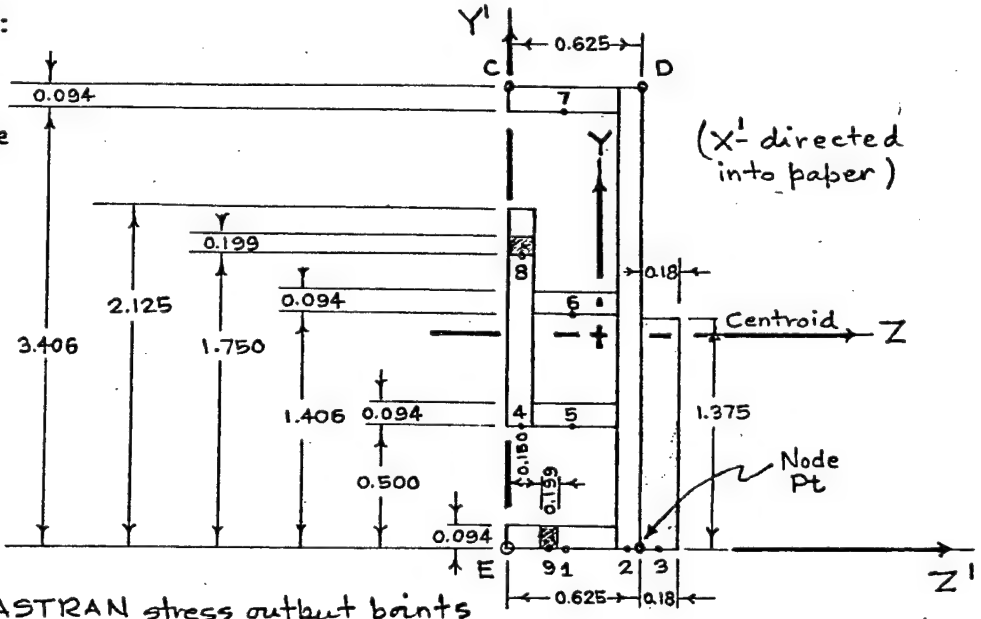
PROPERTY NUMBER: PID 102

ELEMENT NUMBERS:

CBAR 342 thru 359

DESCRIPTION:

Vertical Posts (51) w/ one flange (53) Channel on Dwgs



C, D, E are NASTRAN stress output points

CALCULATIONS:

The following information will be input to the INERTIA program from which section properties will be calculated.

Rectangle No.	Loc Pt Coordinates ** Z_i	Y_i	Basic Dimensions B_i	H_i
1	0.266	0.0	0.531	0.094
2	0.578	0.0	0.094	3.500
3	0.715	0.0	0.18	1.375
4	0.047	0.500	0.094	1.625
5	0.313	0.500	0.437	0.094
6	0.313	1.406	0.437	0.094
7	0.266	3.406	0.531	0.094
* 8	0.047	1.750	0.094	0.199
* 9	0.250	0.0	0.199	0.094

** "Z" corresponds to "X" in the INERTIA Program

* Negative Areas

INERTIA

BAR PROPERTY NUMBER

DESCRIPTION- PID 102 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.53100	.09400	0.00000	0.00000	.26600	0.00000	0.00000
RECT	0.00	.09400	3.50000	0.00000	0.00000	.57800	0.00000	0.00000
RECT	0.00	.18000	1.37500	0.00000	0.00000	.71500	0.00000	0.00000
RECT	0.00	.09400	1.62500	0.00000	0.00000	.04700	.50000	0.00000
RECT	0.00	.43700	.09400	0.00000	0.00000	.31300	.50000	0.00000
RECT	0.00	.43700	.09400	0.00000	0.00000	.31300	1.40600	0.00000
RECT	0.00	.53100	.09400	0.00000	0.00000	.26600	3.40600	0.00000
RECT	-1.00	.09400	.19900	0.00000	0.00000	.04700	1.75000	0.00000
RECT	-1.00	.19900	.09400	0.00000	0.00000	.25000	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.04991	.26600	.04700	.00004	.00117	0.00000	.00015
2	.32900	.57800	1.75000	.33585	.00024	0.00000	.00097
3	.24750	.71500	.68750	.03899	.00067	0.00000	.00267
4	.15275	.04700	1.31250	.03361	.00011	0.00000	.00045
5	.04108	.31300	.54700	.00003	.00065	0.00000	.00012
6	.04108	.31300	1.45300	.00003	.00065	0.00000	.00012
7	.04991	.26600	3.45300	.00004	.00117	0.00000	.00015
8	-.01871	.04700	1.84950	-.00006	-.00001	0.00000	-.00006
9	-.01871	.25000	.04700	-.00001	-.00006	0.00000	-.00006

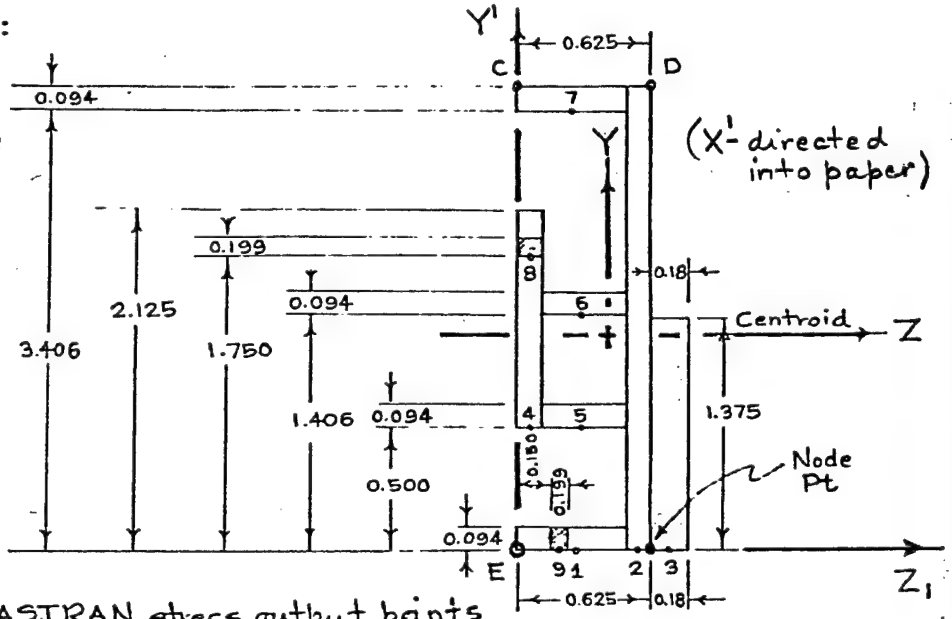
TOTAL AREA=	.874E+00	
X CENTROID DISTANCE=	.482E+00	
Y CENTROID DISTANCE=	.134E+01	
IX (ABOUT CENTROID)=	.866E+00	
IY (ABOUT CENTROID)=	.524E-01	
IXY (ABOUT CENTROID)=	-.284E-01	
IMAX=	.867E+00	
IMIN=	.514E-01	
ALPHA=	.200E+01	
TORSIONAL CONSTANT, K=	.452E-02	
IX (ABOUT INPUT AXIS)=	.243E+01	Y= 0.
IY (ABOUT INPUT AXIS)=	.255E+00	X= 0.
IXY (ABOUT INPUT AXIS)=	.534E+00	

TORSIONAL CONSTANT BASED ON SUM
NOT NECESSARILY ACCURATE

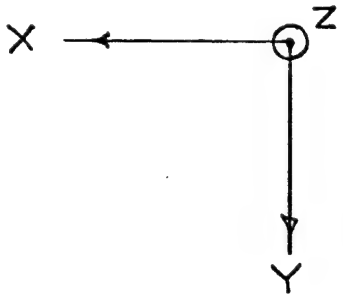
PROPERTY NUMBER: PID 102 (continued)

CBAR 342 thru 344
CBAR 348 thru 350
CBAR 354 thru 356

DESCRIPTION:
Vertical Posts (51) w/ one flange (53) Channel on Dwgs



C, D, E are NASTRAN stress output points



Basic Coordinate Directions

Vector Components for $\bar{V}$

$X_1 = 0.0$ $Y_1 = -1.0$ $Z_1 = -1.0$

Offsets will be:

$X_a = 0.143$ $X_b = 0.143$

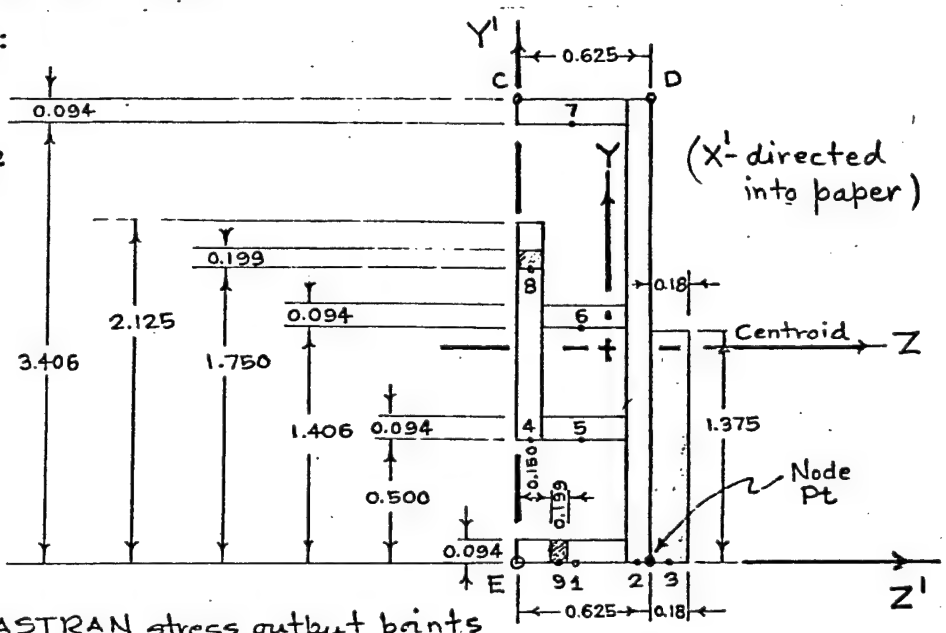
$Y_a = -1.34$ $Y_b = -1.34$

$Z_a = 0.0$ $Z_b = 0.0$

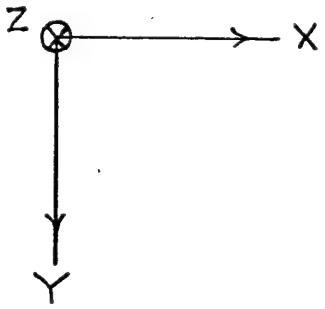
PROPERTY NUMBER: PID102 (continued)

CBAR 345 thru 347
CBAR 351 thru 353
CBAR 357 thru 359

DESCRIPTION:
Vertical Posts (51) w/ one flange (53) Channel on Dwgs



C, D, E are NASTRAN stress output points



Basic Coordinate Directions

Vector Components for $\bar{V}$

$X_1 = 0.0$ $Y_1 = -1.0$ $Z_1 = 1.0$

offsets will be:

$X_a = -0.143$ $X_b = -0.143$

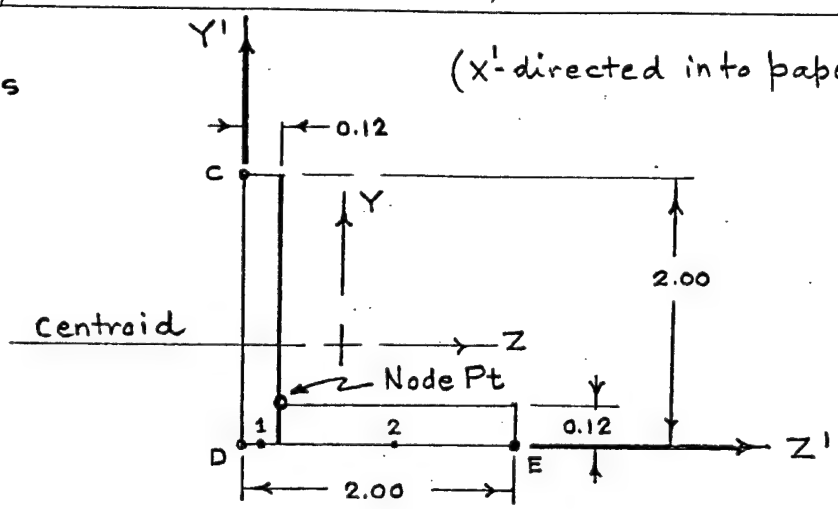
$Y_a = -1.34$ $Y_b = -1.34$

$Z_a = 0.0$ $Z_b = 0.0$

PROPERTY NUMBER: PID 103

ELEMENT NUMBERS: CBAR 268 thru 275
CBAR 300 thru 307
CBAR 251, 254 thru 256, 258 thru 260, 262 thru 264, 267
CBAR 360, 362 thru 364, 366 thru 368, 370 thru 372, 375

DESCRIPTION:
Corner Angles
(21) on Dwgs
0.12 X 2 X 2
AL 2024-T3



C, D, E are NASTRAN stress outputs

CALCULATIONS:

The following information will be input to the INERTIA program from which section properties for the above pictured member will be calculated.

Rectangle No.	Loc Pt Coordinates * Z_i'	Y_i'	Basic Dimensions B_i	H_i
1	0.06	0.0	0.12	2.00
2	1.06	0.0	1.88	0.12

* "Z" corresponds to "X" in the INERTIA Program

INERTIA

WRITTEN BY ANAMET LABORATORIES
SAN CARLOS, CA.

BAR PROPERTY NUMBER
DESCRIPTION- PID 103 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.1200E+00	.2000E+010.		0.	.6000E-010.	0.	
RECT	0.00	.1880E+01	.1200E+000.		0.	.1060E+010.	0.	

OUTPUT

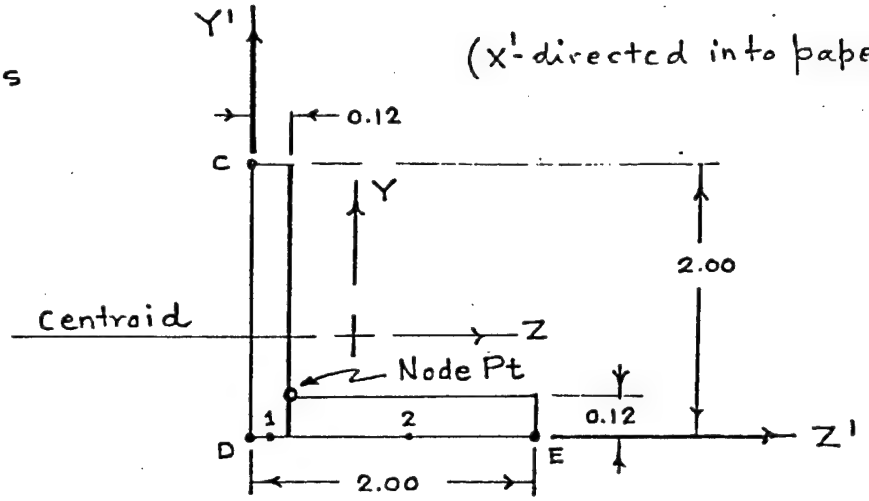
NO.	AREA	XC	YC	IX	IY	IXY	K
1	.240E+00	.600E-01	.100E+01	.800E-01	.288E-03	0.	.115E-02
2	.226E+00	.106E+01	.600E-01	.271E-03	.664E-01	0.	.108E-02

```
*****
*****   TOTAL AREA=                  .466E+00
*****   X CENTROID DISTANCE=         .545E+00
*****   Y CENTROID DISTANCE=         .545E+00
*****   IX (ABOUT CENTROID)=         .183E+00
*****   IY (ABOUT CENTROID)=         .183E+00
*****   IXY (ABOUT CENTROID)=       -.109E+00
*****   IMAX=                        .183E+00
*****   IMIN=                        .183E+00
*****   ALPHA=                       .900E+02
*****   TORSIONAL CONSTANT, K=       .223E-02
*****   IX (ABOUT INPUT AXIS)=       .321E+00      Y= 0.
*****   IY (ABOUT INPUT AXIS)=       .321E+00      X= 0.
*****   IXY (ABOUT INPUT AXIS)=      .287E-01
*****
*****   TORSIONAL CONSTANT BASED ON SUM
*****         NOT NECESSARILY ACCURATE
```

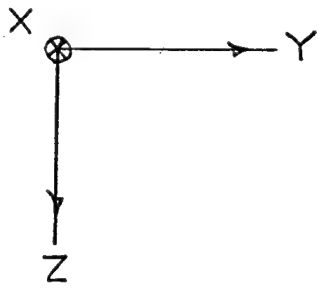
PROPERTY NUMBER: PID103 (continued)

Orientation of Beam Element w.r.t. Basic Coordinate System is shown below for:
CBAR 268 thru 275

DESCRIPTION:
Corner Angles
(21) on Dwgs
0.12 X 2 X 2
AL 2024-T3



C, D, E are NASTRAN stress outputs



Basic Coordinate Directions
Vector Components for $\bar{V}$

$X_1 = 1.0$ $Y_1 = 0.0$ $Z_1 = -1.0$

offsets will be:

$X_a = 0.0$ $X_b = 0.0$

$Y_a = 0.425$ $Y_b = 0.425$

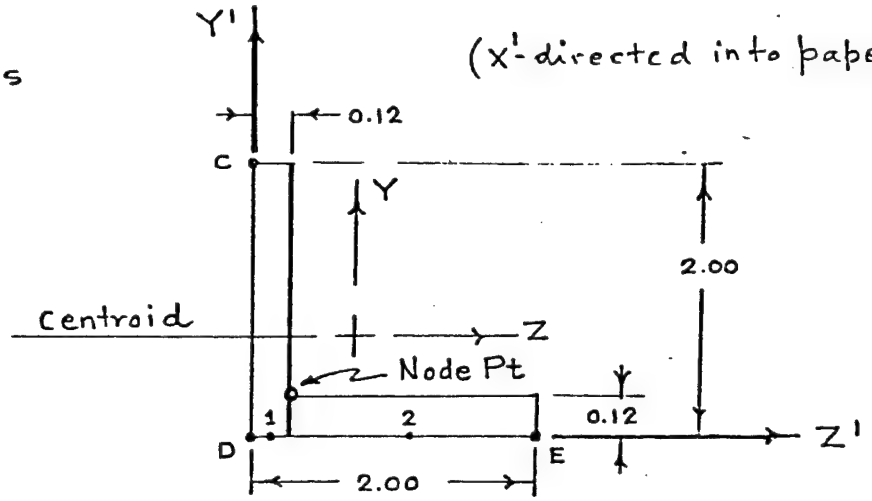
$Z_a = -0.425$ $Z_b = -0.425$

PROPERTY NUMBER: PID103 (continued)

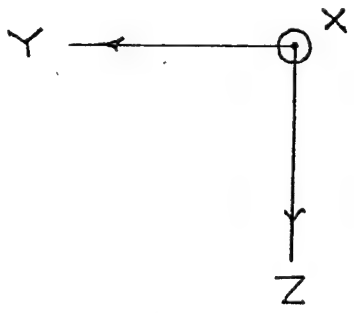
Orientation of Beam Element w.r.t. Basic Coordinate System is shown below for:

CBAR 300 thru 307

DESCRIPTION:
Corner Angles
(21) on Dwgs
0.12 X 2 X 2
AL 2024-T3



C, D, E are NASTRAN stress outputs



Basic Coordinate Directions

Vector components for $\bar{v}$

$X_1 = -1.0$ $Y_1 = 0.0$ $Z_1 = -1.0$

Offsets will be:

$X_a = 0.0$ $X_b = 0.0$

$Y_a = -0.425$ $Y_b = -0.425$

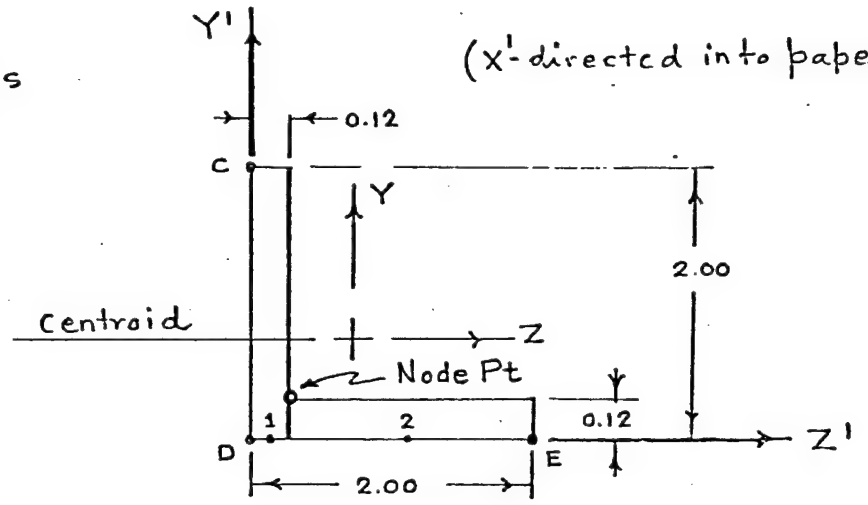
$Z_a = -0.425$ $Z_b = -0.425$

PROPERTY NUMBER: PID 103 (continued)

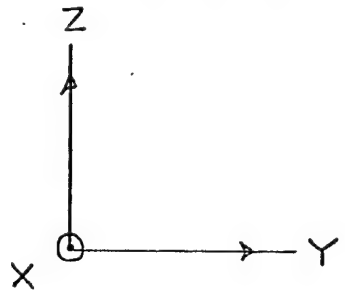
Orientation of beam element w.r.t. Basic Coordinate System is shown below for

CBAR 251, 254 thru 256, 258 thru 260, 262 thru 264, 267

DESCRIPTION:
Corner Angles
(21) on Dwgs
0.12 x 2 x 2
AL 2024-T3



C, D, E are NASTRAN stress outputs



Basic Coordinate Directions

Vector Components for $\bar{V}$

$X_1 = -1.0 \quad Y_1 = 0.0 \quad Z_1 = 1.0$

Offsets will be

$X_a = 0.0 \qquad X_b = 0.0$

$Y_a = 0.425 \qquad Y_b = 0.425$

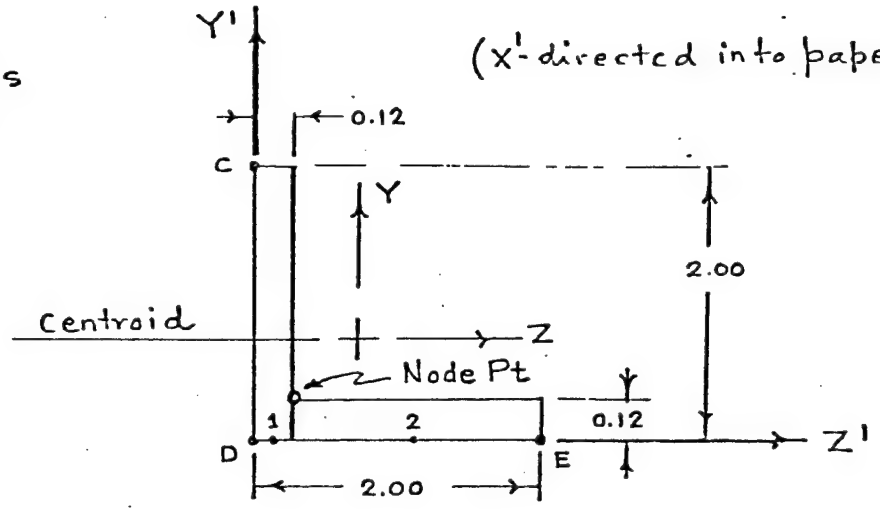
$Z_a = 0.425 \qquad Z_b = 0.425$

PROPERTY NUMBER: PID 103 (continued)

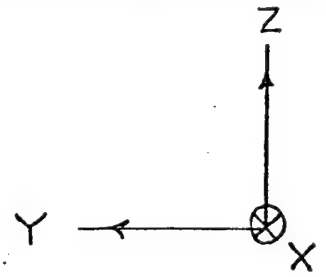
Orientation of Beam Element w.r.t. Basic Coordinate System is shown below for:

CBAR 360, 362 thru 364, 366 thru 368, 170 thru 172, 175

DESCRIPTION:
Corner Angles
(21) on Dwgs
0.12 × 2 × 2
AL 2024-T3



C, D, E are NASTRAN stress outputs



Basic Coordinate Directions
Vector Components for $\bar{v}$

$X_1 = 1.0$ $Y_1 = 0.0$ $Z_1 = 1.0$

Offsets will be:

$X_a = 0.0$ $X_b = 0.0$

$Y_a = -0.425$ $Y_b = -0.425$

$Z_a = 0.425$ $Z_b = 0.425$

PROPERTY NUMBER: PID 104

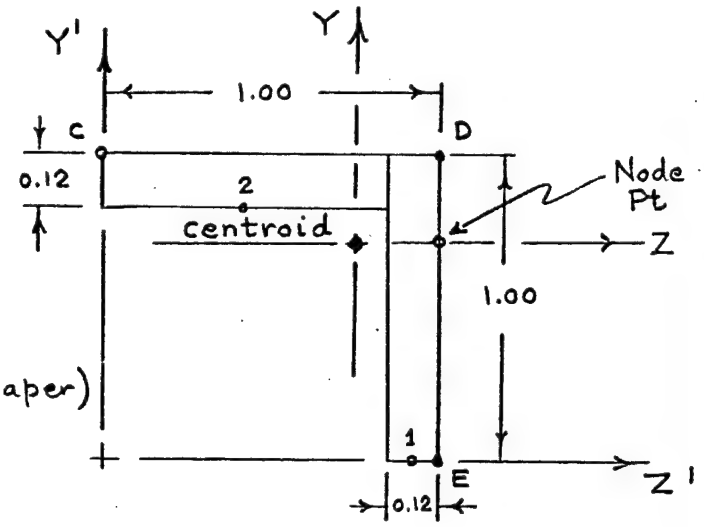
ELEMENT NUMBERS: CBAR 276 thru 283

DESCRIPTION:

Back Plate Support Angle (33) on Dwgs

0.12 x 1 x 1

AL 2024-T3



C, D, E are NASTRAN stress output points

CALCULATIONS:

The following information will be input to the INERTIA program from which section properties for the above pictured member will be calculated.

Rectangle No.	Loc Pt Coordinates * Z_i'	Y_i'	Basic Dimensions B_i	H_i
1	0.94	0.0	0.12	1.00
2	0.44	0.88	0.88	0.12

* "Z" corresponds to "X" in the INERTIA Program.

INERTIA

WRITTEN BY ANAMET LABORATORIES
SAN CARLOS, CA.

BAR PROPERTY NUMBER
DESCRIPTION= PID 104 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.1200E+00	.1000E+010.		0.	.9400E+000.	0.	
RECT	0.00	.8800E+00	.1200E+000.		0.	.4400E+00	.8800E+000.	

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.120E+00	.940E+00	.500E+00	.100E-01	.144E-03	0.	.576E-03
2	.106E+00	.440E+00	.940E+00	.127E-03	.681E-02	0.	.507E-03

```
*****
*****   TOTAL AREA=                  .226E+00
*****   X CENTROID DISTANCE=         .706E+00
*****   Y CENTROID DISTANCE=         .706E+00
*****   IX (ABOUT CENTROID)=         .210E-01
*****   IY (ABOUT CENTROID)=         .210E-01
*****   IXY (ABOUT CENTROID)=       -.124E-01
*****   IMAX=                        .864E-02
*****   IMIN=                        .334E-01
*****   ALPHA=                       .135E+03
*****   TORSIONAL CONSTANT, K=       .108E-02
*****   IX (ABOUT INPUT AXIS)=       .133E+00        Y= 0.
*****   IY (ABOUT INPUT AXIS)=       .133E+00        X= 0.
*****   IXY (ABOUT INPUT AXIS)=      .100E+00
*****
*****   TORSIONAL CONSTANT BASED ON SUM
*****         NOT NECESSARILY ACCURATE
```

PROPERTY NUMBER: PID 104 (continued)

Orientation of Beam Element w.r.t. Basic Coordinate System is shown below for:

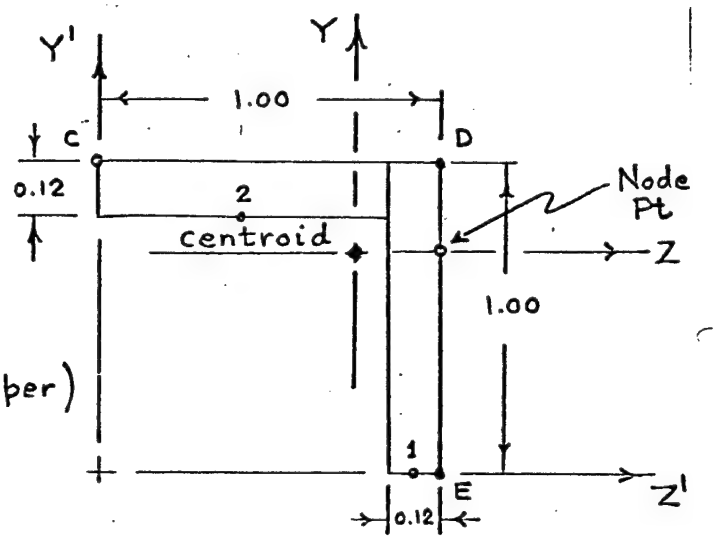
CBAR 276 thru 283

DESCRIPTION:

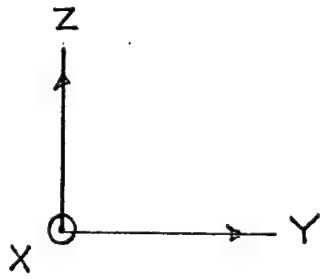
Back Plate Support Angle (33) on Dwgs

0.12 X 1 X 1

AL 2024-T3



C, D, E are NASTRAN stress output points



Basic Coordinate Directions

Vector Components of $\bar{v}$

$X_1 = -1.0$ $Y_1 = 0.0$ $Z_1 = 1.0$

Offsets will be:

$X_a = 0.0$ $X_b = 0.0$

$Y_a = -0.294$ $Y_b = -0.294$

$Z_a = 0.0$ $Z_b = 0.0$

PROPERTY NUMBER: PID 105

ELEMENT NUMBERS: CBAR 312, 313

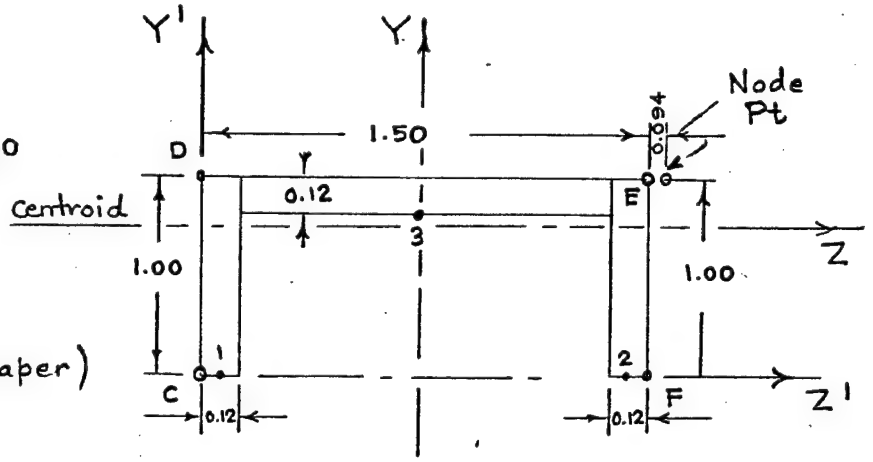
DESCRIPTION:

Roof Channels

(41) on Dwgs

0.12 x 1.00 x 1.00 x 1.50

AL 2024-T3



C, D, E, F are NASTRAN Stress Output Points

CALCULATIONS:

The following information will be input to the INERTIA program which will calculate section properties for the above pictured member.

Rectangle No.	Loc Pt Coordinates * Z_i'	Y_i'	Basic Dimensions B_i	H_i
1	0.06	0.0	0.12	1.00
2	1.44	0.0	0.12	1.00
3	0.75	0.88	1.26	0.12

* "Z" corresponds to "X" in INERTIA Program

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID 105 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.12000	1.00000	0.00000	0.00000	.06000	0.00000	0.00000
RECT	0.00	.12000	1.00000	0.00000	0.00000	1.44000	0.00000	0.00000
RECT	0.00	1.26000	.12000	0.00000	0.00000	.75000	.88000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.12000	.06000	.50000	.01000	.00014	0.00000	.00058
2	.12000	1.44000	.50000	.01000	.00014	0.00000	.00058
3	.15120	.75000	.94000	.00018	.02000	0.00000	.00073

```
TOTAL AREA=                  .391E+00
X CENTROID DISTANCE=         .750E+00
Y CENTROID DISTANCE=         .670E+00
IX (ABOUT CENTROID)=         .381E-01
IY (ABOUT CENTROID)=         .135E+00
IXY (ABOUT CENTROID)=        .178E-14
IMAX=                        .135E+00
IMIN=                        .381E-01
ALPHA=                      -.180E+03
TORSIONAL CONSTANT, K=       .188E-02
IX (ABOUT INPUT AXIS)=       .214E+00          Y= 0.
IY (ABOUT INPUT AXIS)=       .355E+00          X= 0.
IXY (ABOUT INPUT AXIS)=      .197E+00

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

PROPERTY NUMBER: PID 105 (continued)

Orientation of Beam Elements w.r.t. Basic Coordinate System is shown below for:

CBAR 312, 313

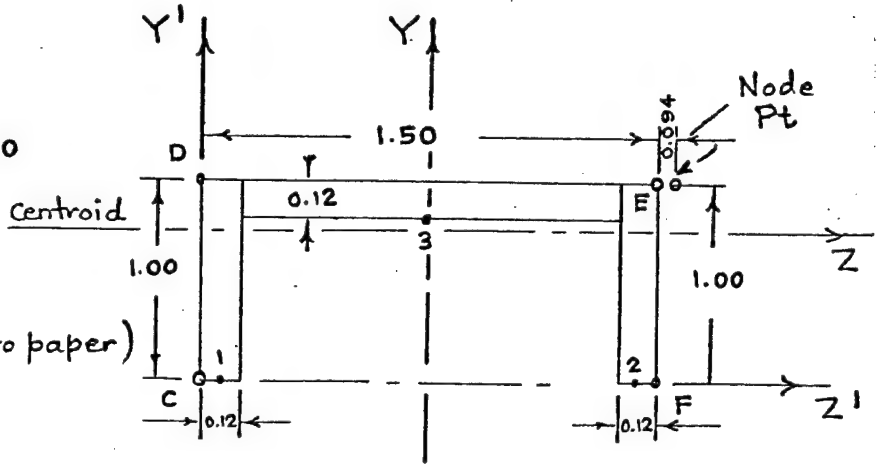
DESCRIPTION:

Roof Channels

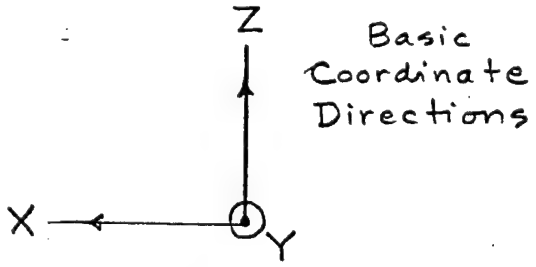
(41) on Dwgs

0.12 x 1.00 x 1.00 x 1.50

AL 2024-T3



C, D, E, F are NASTRAN Stress Output Points



$\bar{V}$ Components

$X_1 = 0.0$ $Y_1 = -1.0$ $Z_1 = 1.0$

offsets will be:

$X_a = 0.844$ $X_b = 0.844$

$Y_a = 0.0$ $Y_b = 0.0$

$Z_a = -0.330$ $Z_b = -0.330$

PROPERTY NUMBER: PID 106

ELEMENT NUMBERS:

CBAR 314 thru 323

DESCRIPTION:

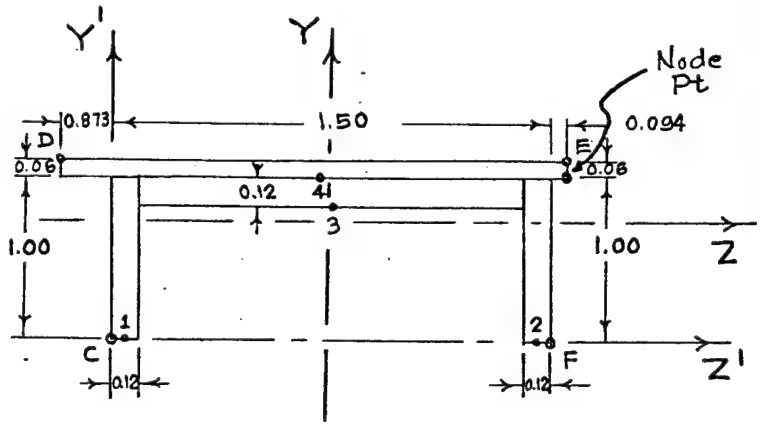
Roof Channels (41) on Dwgs

0.12 X 1.00 X 1.00 X 1.50

AL 2024-T3

plus part of roof plate (27)

Centroid



(X'-directed into paper)

C, D, E, F are NASTRAN Stress Output Points

CALCULATIONS:

The following information will be input to the INERTIA program which will calculate section properties for the above pictured member.

Rectangle No.	Loc Pt Coordinates *Z'_i	Y'_i	Basic Dimensions B_i	H_i
1	0.06	0.0	0.12	1.00
2	1.44	0.0	0.12	1.00
3	0.75	0.88	1.26	0.12
4	0.361	1.00	2.467	0.06

*"Z" corresponds to "X" in the INERTIA Program

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID 106 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.12000	1.00000	0.00000	0.00000	.06000	0.00000	0.00000
RECT	0.00	.12000	1.00000	0.00000	0.00000	1.44000	0.00000	0.00000
RECT	0.00	1.26000	.12000	0.00000	0.00000	.75000	.88000	0.00000
RECT	0.00	2.46700	.06000	0.00000	0.00000	.36100	1.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.12000	.06000	.50000	.01000	.00014	0.00000	.00058
2	.12000	1.44000	.50000	.01000	.00014	0.00000	.00058
3	.15120	.75000	.94000	.00018	.02000	0.00000	.00073
4	.14802	.36100	1.03000	.00004	.07507	0.00000	.00018

```
*****
*****    TOTAL AREA=                  .539E+00
*****    X CENTROID DISTANCE=         .643E+00
*****    Y CENTROID DISTANCE=         .769E+00
*****    IX (ABOUT CENTROID)=         .521E-01
*****    IY (ABOUT CENTROID)=         .226E+00
*****    IXY (ABOUT CENTROID)=       -.150E-01
*****    IMAX=                        .227E+00
*****    IMIN=                        .508E-01
*****    ALPHA=                       .175E+03
*****    TORSIONAL CONSTANT, K=       .206E-02
*****    IX (ABOUT INPUT AXIS)=       .371E+00          Y= 0.
*****    IY (ABOUT INPUT AXIS)=       .449E+00          X= 0.
*****    IXY (ABOUT INPUT AXIS)=      .252E+00
*****
*****    TORSIONAL CONSTANT BASED ON SUM
*****          NOT NECESSARILY ACCURATE
```

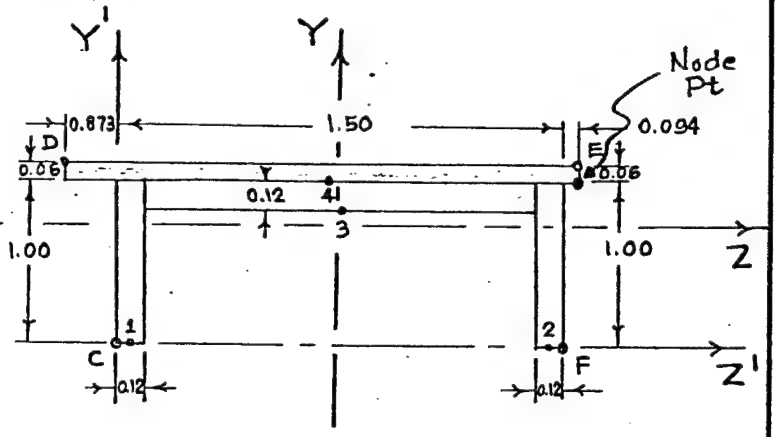
PROPERTY NUMBER: PID 106 (continued)

Orientation of Beam Element w.r.t. Basic Coordinate System is shown below for:

CBAR 316, 317, 320, 321

CBAR 314, 315, 318, 319, 322, 323

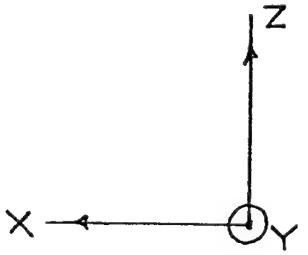
DESCRIPTION:
Roof Channels
(41) on Dwgs
0.12 X 1.00 X 1.00 X 1.50
AL 2024-T3
plus part of
roof plate (27)



(X'- directed into paper)

C, D, E, F are NASTRAN Stress Output Points

CBAR 316, 317, 320, 321



Basic Coordinate Directions

$\bar{v}$ Components

$X_1 = 0.0$ $Y_1 = -1.0$ $Z_1 = 1.0$

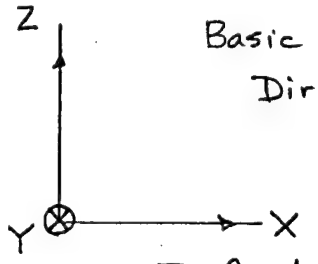
offsets will be:

$X_a = 0.951$ $X_b = 0.951$

$Y_a = 0.0$ $Y_b = 0.0$

$Z_a = -0.231$ $Z_b = -0.231$

CBAR 314, 315, 318, 319, 322, 323



Basic Coordinate Directions

$\bar{v}$ Components

$X_1 = 0.0$ $Y_1 = 1.0$ $Z_1 = 1.0$

Offsets will be:

$X_a = -0.951$ $X_b = -0.951$

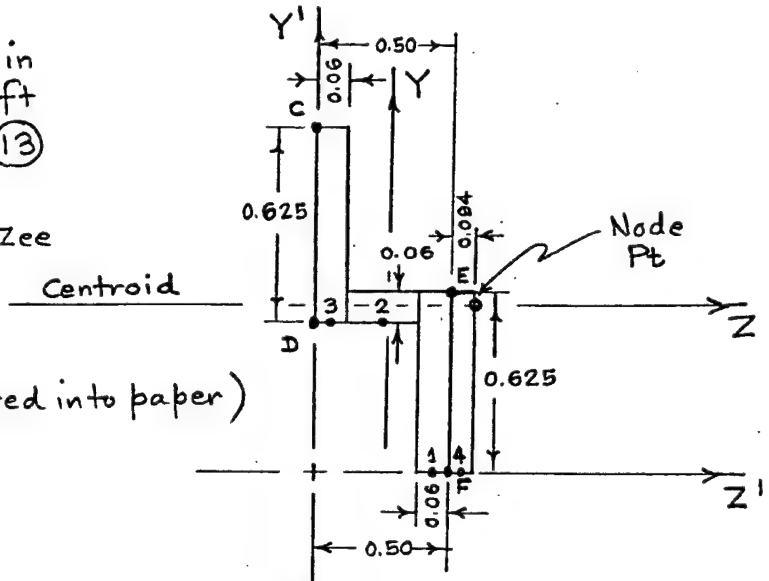
$Y_a = 0.0$ $Y_b = 0.0$

$Z_a = -0.231$ $Z_b = -0.231$

PROPERTY NUMBER: PID107

ELEMENT NUMBERS: CBAR 380 thru 384
CBAR 390, 392 thru 399

DESCRIPTION:
Zee Sections in Right and Left Side Panels (13) on Dwgs
0.06X0.50X1.0 Zee
AL 2024-T3



(X'- directed into paper)

C, D, E, F are NASTRAN stress output points

CALCULATIONS:

The following information will be input to the INERTIA program which will calculate section properties for the above pictured member.

Rectangle No.	Loc Pt Coordinates *Z_i'	Y_i'	Basic Dimensions B_i	H_i
1	0.47	0.0	0.06	0.625
2	0.25	0.565	0.38	0.06
3	0.03	0.565	0.06	0.625
4	0.547	0.0	0.094	0.625

* "Z" corresponds to "X" in the INERTIA Program

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION= PID 107 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.06000	.62500	0.00000	0.00000	.47000	0.00000	0.00000
RECT	0.00	.38000	.06000	0.00000	0.00000	.25000	.56500	0.00000
RECT	0.00	.06000	.62500	0.00000	0.00000	.03000	.56500	0.00000
RECT	0.00	.09400	.62500	0.00000	0.00000	.54700	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.03750	.47000	.31250	.00122	.00001	0.00000	.00005
2	.02280	.25000	.59500	.00001	.00027	0.00000	.00003
3	.03750	.03000	.87750	.00122	.00001	0.00000	.00005
4	.05875	.54700	.31250	.00191	.00004	0.00000	.00017

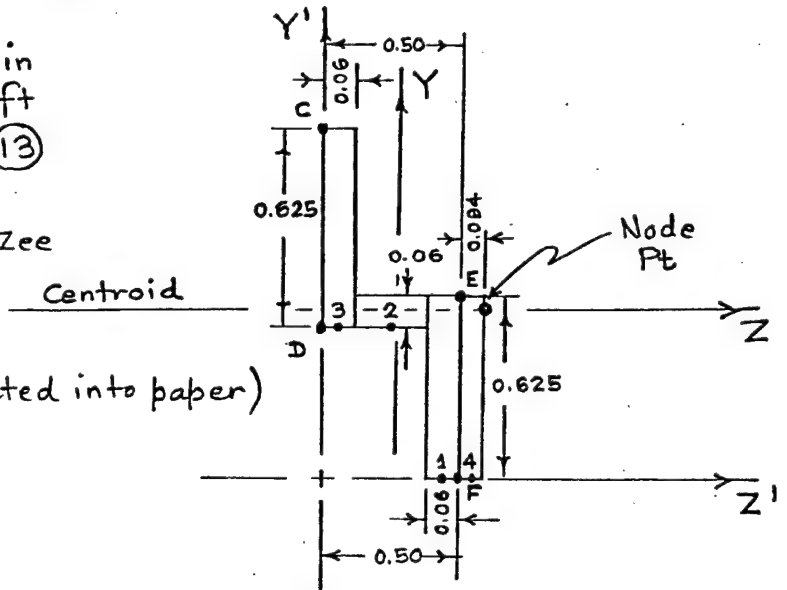
```
TOTAL AREA=                    .157E+00
X CENTROID DISTANCE=           .361E+00
Y CENTROID DISTANCE=           .489E+00
IX (ABOUT CENTROID)=           .133E-01
IY (ABOUT CENTROID)=           .721E-02
IXY (ABOUT CENTROID)=         -.774E-02
IMAX=                          .186E-01
IMIN=                          .193E-02
ALPHA=                         .343E+02
TORSIONAL CONSTANT, K=         .290E-03
IX (ABOUT INPUT AXIS)=         .507E-01         Y= 0.
IY (ABOUT INPUT AXIS)=         .277E-01         X= 0.
IXY (ABOUT INPUT AXIS)=        .199E-01

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

PROPERTY NUMBER: PID 107 (continued)

Orientation of Beam Elements w.r.t. Basic Coordinate System is shown below for :

CBAR 380 thru 384 and
CBAR 390, 392 thru 399

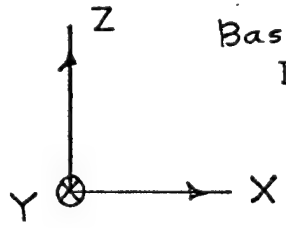
DESCRIPTION:
Zee Sections in Right and Left Side Panels (13) on Dwgs
0.06 X 0.50 X 1.0 Zee
AL 2024-T3



(X' - directed into paper)

C, D, E, F are NASTRAN stress output points

CBAR 380 thru 384



Basic Coordinate Directions

$\bar{v}$ Components

$X_1 = 0.0$ $Y_1 = 1.0$ $Z_1 = 1.0$

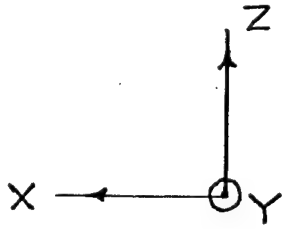
Offsets will be :

$X_a = -0.233$ $X_b = -0.233$

$Y_a = 0.0$ $Y_b = 0.0$

$Z_a = 0.0$ $Z_b = 0.0$

CBAR 390, 392 thru 399



Basic Coordinate Directions

$\bar{v}$ Components

$X_1 = 0.0$ $Y_1 = -1.0$ $Z_1 = 1.0$

Offsets will be :

$X_a = 0.233$ $X_b = 0.233$

$Y_a = 0.0$ $Y_b = 0.0$

$Z_a = 0.0$ $Z_b = 0.0$

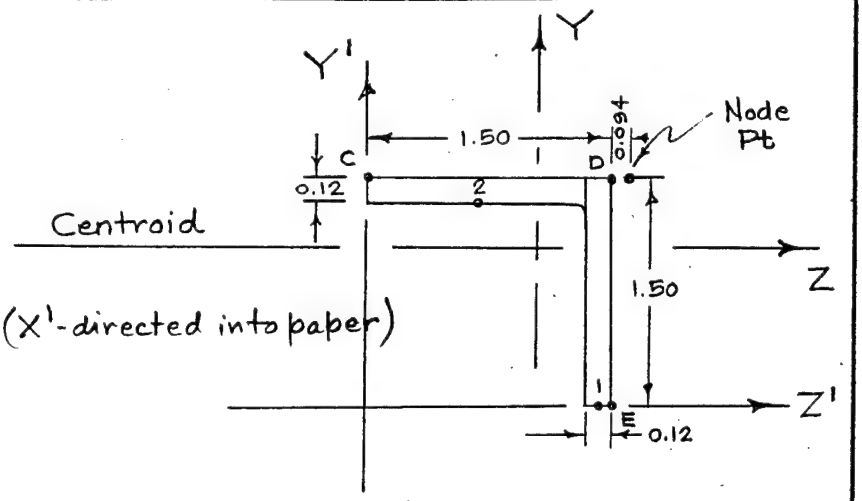
PROPERTY NUMBER: PID 108

ELEMENT NUMBERS:

CBAR 308,309

DESCRIPTION:

Left Top Corner
∠ (55) on Dwg
0.12 X 1.5 X 1.5 ∠
AL 2024-T3



C, D, E are NASTRAN Stress Output points

CALCULATIONS:

The following information will be input to the INERTIA program which will calculate section properties for the above member.

Rectangle No.	Basic Dimensions B_i	H_i	Loc Pt Coordinates * Z_i'	Y_i'
1	0.12	1.50	1.44	0.0
2	1.38	0.12	0.69	1.38

*"Z" corresponds to "X" in the INERTIA program

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID 108 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.12000	1.50000	0.00000	0.00000	1.44000	0.00000	0.00000
RECT	0.00	1.38000	.12000	0.00000	0.00000	.69000	1.38000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.18000	1.44000	.75000	.03375	.00022	0.00000	.00086
2	.16560	.69000	1.44000	.00020	.02628	0.00000	.00079

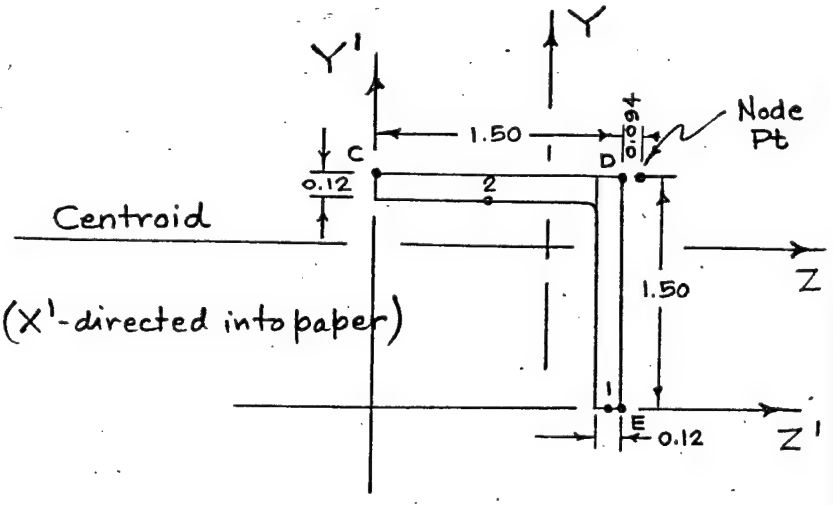
```
TOTAL AREA=                    .346E+00
X CENTROID DISTANCE=           .108E+01
Y CENTROID DISTANCE=           .108E+01
IX (ABOUT CENTROID)=           .750E-01
IY (ABOUT CENTROID)=           .750E-01
IXY (ABOUT CENTROID)=         -.446E-01
IMAX=                          .120E+00
IMIN=                          .304E-01
ALPHA=                         .450E+02
TORSIONAL CONSTANT, K=         .166E-02
IX (ABOUT INPUT AXIS)=         .479E+00          Y= 0.
IY (ABOUT INPUT AXIS)=         .479E+00          X= 0.
IXY (ABOUT INPUT AXIS)=        .359E+00

TORSIONAL CONSTANT BASED ON SUM
       NOT NECESSARILY ACCURATE
```

PROPERTY NUMBER: 108 (continued)

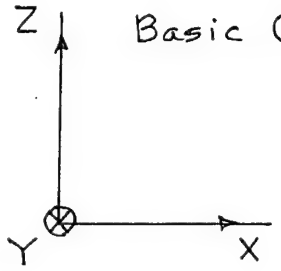
Orientation of Beam Elements w.r.t. Basic Coordinate System is shown below for

CBAR 308, 309

DESCRIPTION:
Left Top Corner
∠ (55) on Dwg
0.12 X 1.5 X 1.5 ∠
AL 2024-T3



C, D, E are NASTRAN Stress Output points



Basic Coordinate Directions

$\bar{v}$ components

$X_1 = 0.0$ $Y_1 = 1.0$ $Z_1 = 1.0$

Offsets will be:

$X_a = -0.514$ $X_b = -0.514$

$Y_a = 0.0$ $Y_b = 0.0$

$Z_a = -0.420$ $Z_b = -0.420$

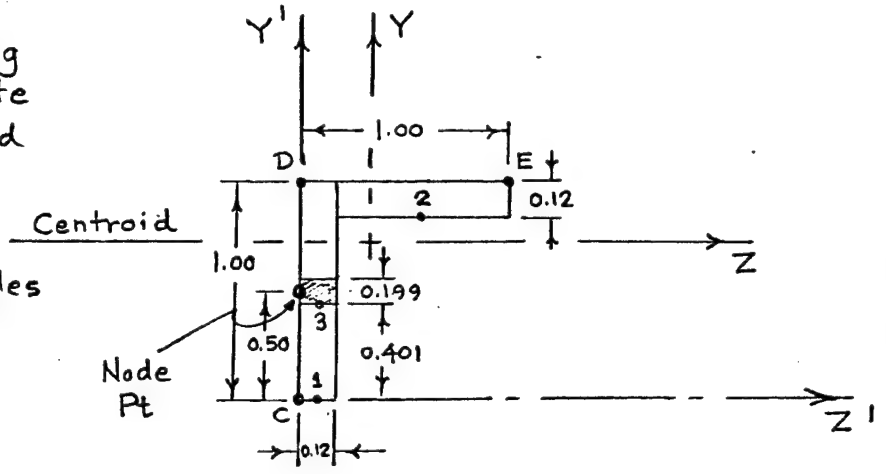
PROPERTY NUMBER: PID 109

ELEMENT NUMBERS: CBAR 404, 405, 408 thru 411, 413, 415, 416
418, 420, 421, 423, 425, 426
428, 430, 431, 433, 435, 436

DESCRIPTION:

Diagonal Bracing for Intermediate Bays designated ⑦ ⑨

0.12X1.0X1.0 angles
AL 2024-T3



C, D, E are NASTRAN stress output points

CALCULATIONS:

The following information will be input to the INERTIA program which will calculate section properties for the above pictured member.

Rectangle No.	Loc Pt Coordinates Z'_i	Y'_i	Basic Dimensions B_i	H_i
1	0.06	0.0	0.12	1.00
2	0.56	0.88	0.88	0.12
* 3	0.06	0.401	0.12	0.199

* Negative Area

INERTIA

WRITTEN BY ANAMET LABORATORIES
SAN CARLOS, CA.

BAR PROPERTY NUMBER
DESCRIPTION- PID 109 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.1200E+00	.1000E+010.	0.		.6000E-010.	0.	
RECT	0.00	.8800E+00	.1200E+000.	0.		.5600E+00	.8800E+000.	
RECT	-1.00	.1200E+00	.1990E+000.	0.		.6000E-01	.4010E+000.	

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.120E+00	.600E-01	.500E+00	.100E-01	.144E-03	0.	.576E-03
2	.106E+00	.560E+00	.940E+00	.127E-03	.681E-02	0.	.507E-03
3	-.239E-01	.600E-01	.501E+00	-.788E-04	-.287E-04	0.	-.115E-03

```
*****
*****
*****   TOTAL AREA=                  .202E+00
*****   X CENTROID DISTANCE=         .322E+00
*****   Y CENTROID DISTANCE=         .730E+00
*****   IX (ABOUT CENTROID)=         .198E-01
*****   IY (ABOUT CENTROID)=         .195E-01
*****   IXY (ABOUT CENTROID)=        .111E-01
*****   IMAX=                        .307E-01
*****   IMIN=                        .858E-02
*****   ALPHA=                      -.446E+02
*****   TORSIONAL CONSTANT, K=       .968E-03
*****   IX (ABOUT INPUT AXIS)=       .127E+00        Y= 0.
*****   IY (ABOUT INPUT AXIS)=       .404E-01        X= 0.
*****   IXY (ABOUT INPUT AXIS)=      .585E-01
*****
*****   TORSIONAL CONSTANT BASED ON SUM
*****         NOT NECESSARILY ACCURATE
```

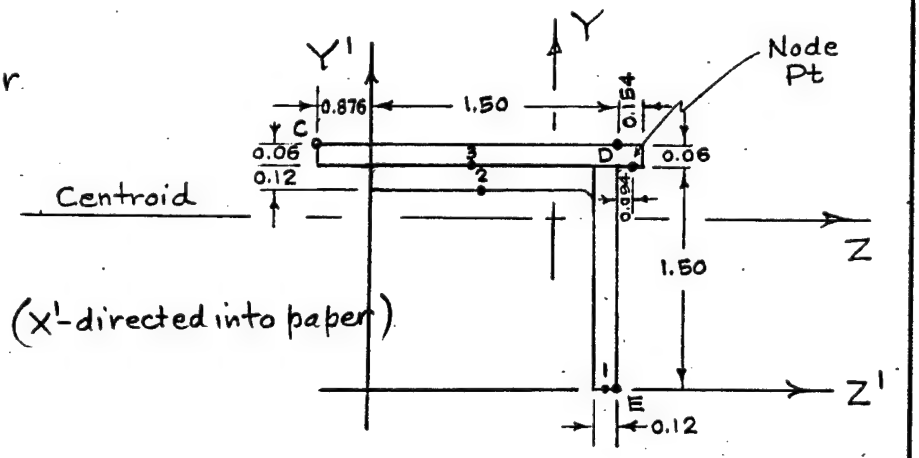
PROPERTY NUMBER: PID 110

ELEMENT NUMBERS:

CBAR 310, 311

DESCRIPTION:

Right Top Corner
& (55) on Dwg
0.12 X 1.5 X 1.5 &
AL 2024-T3



C, D, E are NASTRAN Stress Output Points

CALCULATIONS:

The following information will be input to the INERTIA program which will calculate section properties for the above member.

Rectangle No.	Basic Dimensions B_i	H_i	Loc Pt Coordinates * Z'_i	Y'_i
1	0.12	1.50	1.44	0.0
2	1.38	0.12	0.69	1.38
3	2.53	0.06	0.389	1.50

*"Z" corresponds to "X" in the INERTIA program

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID 110 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.12000	1.50000	0.00000	0.00000	1.44000	0.00000	0.00000
RECT	0.00	1.38000	.12000	0.00000	0.00000	.69000	1.38000	0.00000
RECT	0.00	2.53000	.06000	0.00000	0.00000	.38900	1.50000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.18000	1.44000	.75000	.03375	.00022	0.00000	.00086
2	.16560	.69000	1.44000	.00020	.02628	0.00000	.00079
3	.15180	.38900	1.53000	.00005	.08097	0.00000	.00018

```
TOTAL AREA=                   .497E+00
X CENTROID DISTANCE=          .870E+00
Y CENTROID DISTANCE=          .122E+01
IX (ABOUT CENTROID)=          .964E-01
IY (ABOUT CENTROID)=          .206E+00
IXY (ABOUT CENTROID)=        -.774E-01
IMAX=                         .246E+00
IMIN=                         .564E-01
ALPHA=                        .153E+03
TORSIONAL CONSTANT, K=        .184E-02
IX (ABOUT INPUT AXIS)=        .834E+00          Y= 0.
IY (ABOUT INPUT AXIS)=        .583E+00          X= 0.
IXY (ABOUT INPUT AXIS)=       .449E+00

TORSIONAL CONSTANT BASED ON SUM
      NOT NECESSARILY ACCURATE
```

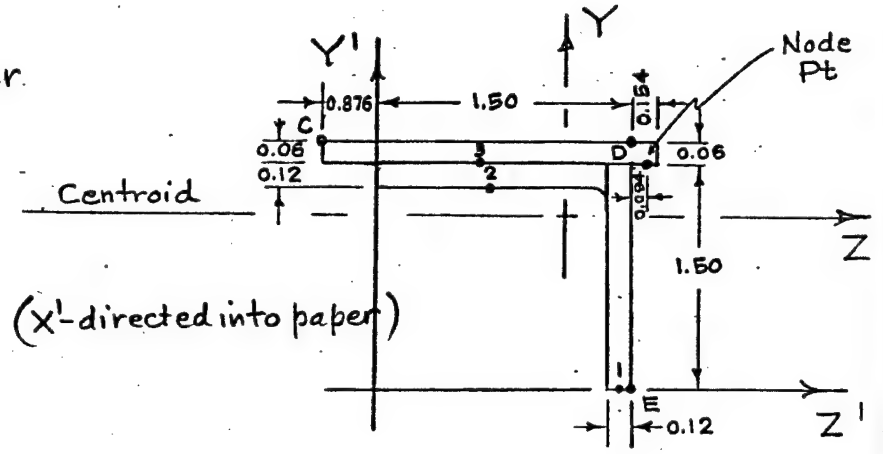
PROPERTY NUMBER: 110 (continued)

Orientation of Beam Elements w.r.t. Basic Coordinate System is shown below for

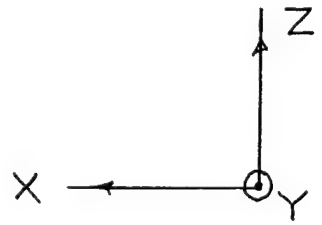
CBAR 310, 311

DESCRIPTION:

Right Top Corner
∠ (55) on Dwg
0.12 X 1.5 X 1.5 ∠
AL 2024-T3



C, D, E are NASTRAN Stress Output Points



Basic Coordinate Directions

$\bar{V}$ components

$X_1 = 0.0 \quad Y_1 = -1.0 \quad Z_1 = 1.0$

Offsets will be:

$X_a = 0.724$ $\quad X_b = 0.724$

$Y_a = 0.0$ $\quad Y_b = 0.0$

$Z_a = -0.280$ $\quad Z_b = -0.280$

PROPERTY NUMBER: PID 111

ELEMENT NUMBERS: CBAR 443 thru 485

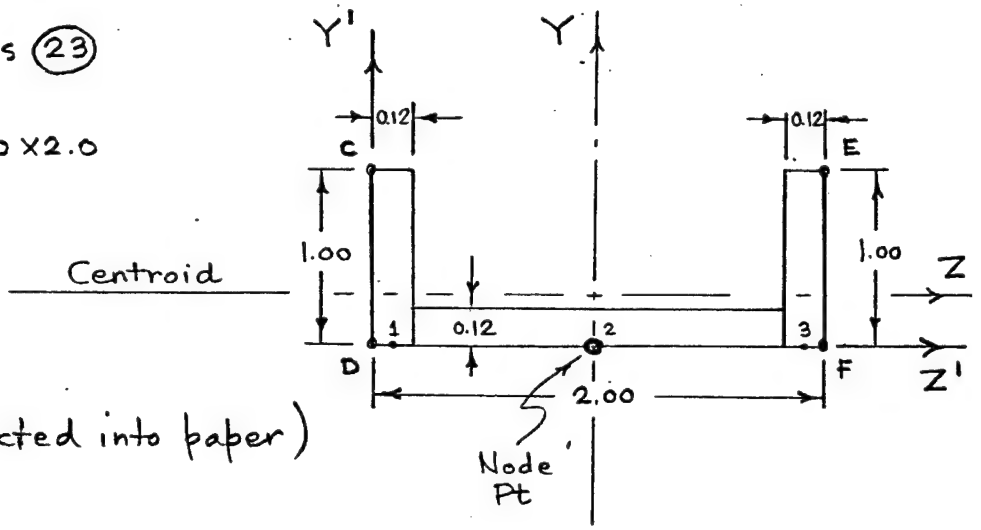
DESCRIPTION:

Floor Channels (23)

on Dwgs

0.12 X 1.0 X 1.0 X 2.0

AL 2024-T3



(X'-directed into paper)

C, D, E, F are NASTRAN Stress Output Points

CALCULATIONS:

The following information will be input to the INERTIA program which will calculate section properties for the above pictured member.

Rectangle No.	Loc Pt Coordinates $*Z_i'$	Y_i'	Basic Dimensions B_i	H_i
1	0.06	0.0	0.12	1.00
2	1.00	0.0	1.76	0.12
3	1.94	0.0	0.12	1.00

* "Z" corresponds to "X" in INERTIA Program

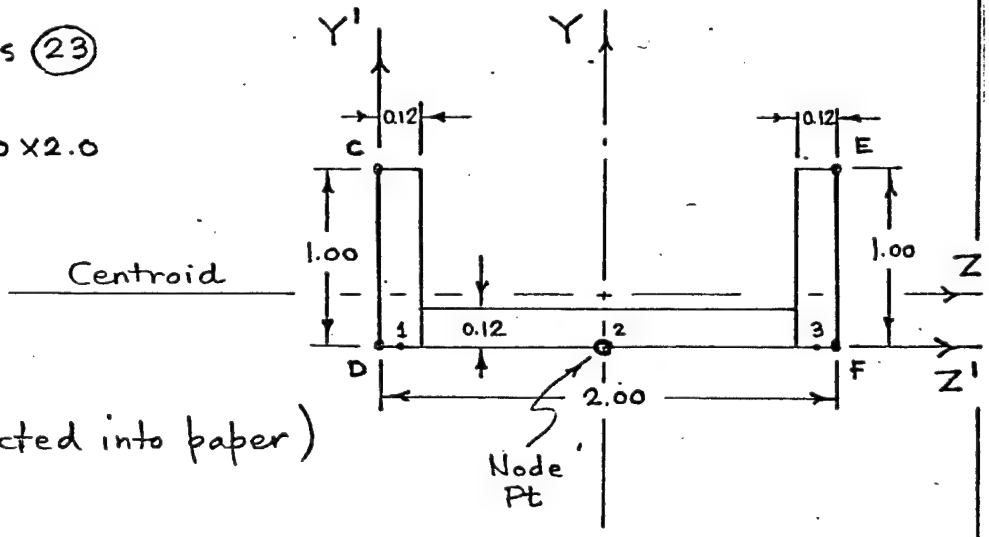
PROPERTY NUMBER: PID111 (continued)

Orientation of Beam Element w.r.t. Basic Coordinate System is shown below for:

(a) CBAR 443, 444, 461, 462, 466 thru 468, 472 thru 474, and 478 thru 481

(b) CBAR 463 thru 465, 469 thru 471, 475 thru 477, and 482 thru 485

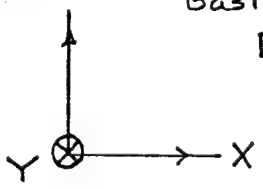
DESCRIPTION:
Floor Channels (23)
on Dwgs
0.12 X 1.0 X 1.0 X 2.0
AL 2024-T3



(X'-directed into paper)

C, D, E, F are NASTRAN Stress Output Points

(a) Z



Basic Coordinate Directions

$\bar{v}$ Components

$X_1 = 0.0$ $Y_1 = 1.0$ $Z_1 = 1.0$

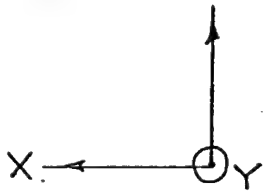
Offsets will be:

$X_a = 0.0$ $X_b = 0.0$

$Y_a = 0.0$ $Y_b = 0.0$

$Z_a = 0.294$ $Z_b = 0.294$

(b) Z



Basic Coordinate Directions

$\bar{v}$ Components

$X_1 = 0.0$ $Y_1 = -1.0$ $Z_1 = 1.0$

Offsets will be:

$X_a = 0.0$ $X_b = 0.0$

$Y_a = 0.0$ $Y_b = 0.0$

$Z_a = 0.294$ $Z_b = 0.294$

INERTIA

WRITTEN BY ANAMET LABORATORIES
SAN CARLOS, CA.

BAR PROPERTY NUMBER
DESCRIPTION- PID III RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.1200E+00	.1000E+010.		0.	.6000E-010.	0.	
RECT	0.00	.1760E+01	.1200E+000.		0.	.1000E+010.	0.	
RECT	0.00	.1200E+00	.1000E+010.		0.	.1940E+010.	0.	

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.120E+00	.600E-01	.500E+00	.100E-01	.144E-03	0.	.576E-03
2	.211E+00	.100E+01	.600E-01	.253E-03	.545E-01	0.	.101E-02
3	.120E+00	.194E+01	.500E+00	.100E-01	.144E-03	0.	.576E-03

```
*****
*****   TOTAL AREA=                .451E+00
*****   X CENTROID DISTANCE=       .100E+01
*****   Y CENTROID DISTANCE=       .294E+00
*****   IX (ABOUT CENTROID)=       .420E-01
*****   IY (ABOUT CENTROID)=       .267E+00
*****   IXY (ABOUT CENTROID)=      .888E-15
*****   IMAX=                      .420E-01
*****   IMIN=                      .267E+00
*****   ALPHA=                    -.180E+03
*****   TORSIONAL CONSTANT, K=     .217E-02
*****   IX (ABOUT INPUT AXIS)=     .810E-01        Y= 0.
*****   IY (ABOUT INPUT AXIS)=     .718E+00        X= 0.
*****   IXY (ABOUT INPUT AXIS)=    .153E+00
*****
*****   TORSIONAL CONSTANT BASED ON SUM
*****         NOT NECESSARILY ACCURATE
```

PROPERTY NUMBER: PID 112

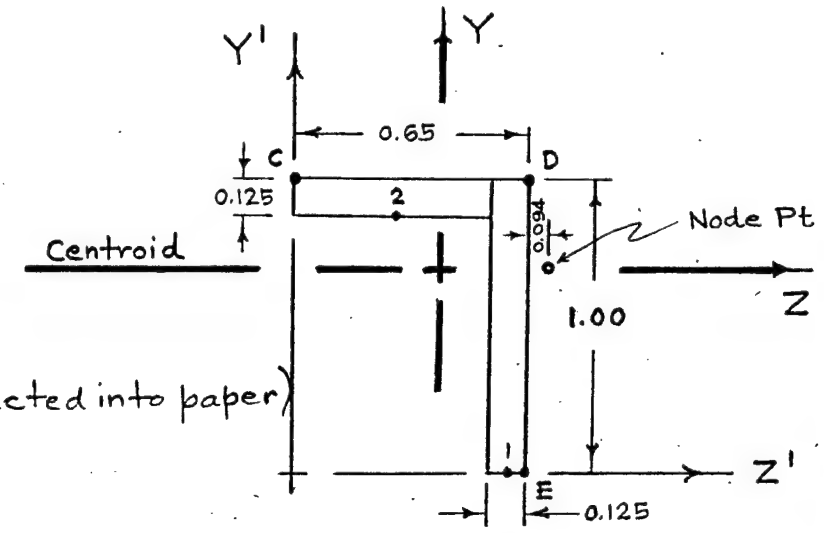
ELEMENT NUMBERS: CBAR 286 thru 289

DESCRIPTION:

(77) Angles in Right Side Panel

0.125 x 0.65 x 1.0 L

AL 2024-T3



C, D, E are NASTRAN Stress Output Pts

CALCULATIONS:

The following information was input to the INERTIA program which calculated section properties for the above member.

Rectangle No	Basic Dimensions B_i	H_i	Loc Pt Coordinates * Z_i	Y_i
1	0.125	1.00	0.588	0.0
2	0.525	0.125	0.263	0.875

*"Z" corresponds to "X" in INERTIA program

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION= PID 112 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.12500	1.00000	0.00000	0.00000	.58800	0.00000	0.00000
RECT	0.00	.52500	.12500	0.00000	0.00000	.26300	.87500	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.12500	.58800	.50000	.01042	.00016	0.00000	.00065
2	.06563	.26300	.93750	.00009	.00151	0.00000	.00034

```
TOTAL AREA=                    .191E+00
X CENTROID DISTANCE=           .476E+00
Y CENTROID DISTANCE=           .651E+00
IX (ABOUT CENTROID)=           .187E-01
IY (ABOUT CENTROID)=           .622E-02
IXY (ABOUT CENTROID)=         -.612E-02
IMAX=                          .212E-01
IMIN=                          .372E-02
ALPHA=                         .222E+02
TORSIONAL CONSTANT, K=         .993E-03
IX (ABOUT INPUT AXIS)=         .994E-01          Y= 0.
IY (ABOUT INPUT AXIS)=         .494E-01          X= 0.
IXY (ABOUT INPUT AXIS)=        .529E-01

TORSIONAL CONSTANT BASED ON SUM
       NOT NECESSARILY ACCURATE
```

PROPERTY NUMBER: 112 (continued)

Orientation of Beam Elements w.r.t. Basic Coordinate System is shown below for:

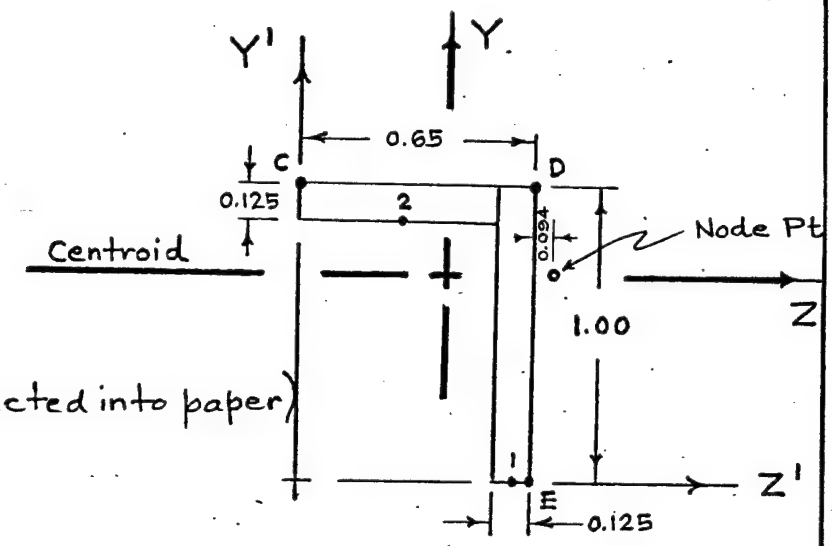
CBAR 286 thru 289

DESCRIPTION:

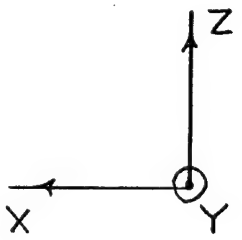
(77) Angles in Right Side Panel

0.125 x 0.65 x 1.0 &

AL 2024-T3



C, D, E are NASTRAN Stress Output Pts



Basic Coordinate Directions

$\bar{v}$ components

$X_1 = 0.0$ $Y_1 = -1.0$ $Z_1 = 1.0$

Offsets will be:

$X_a = 0.268$ $X_b = 0.268$

$Y_a = 0.0$ $Y_b = 0.0$

$Z_a = 0.0$ $Z_b = 0.0$

PROPERTY NUMBER: PID 113

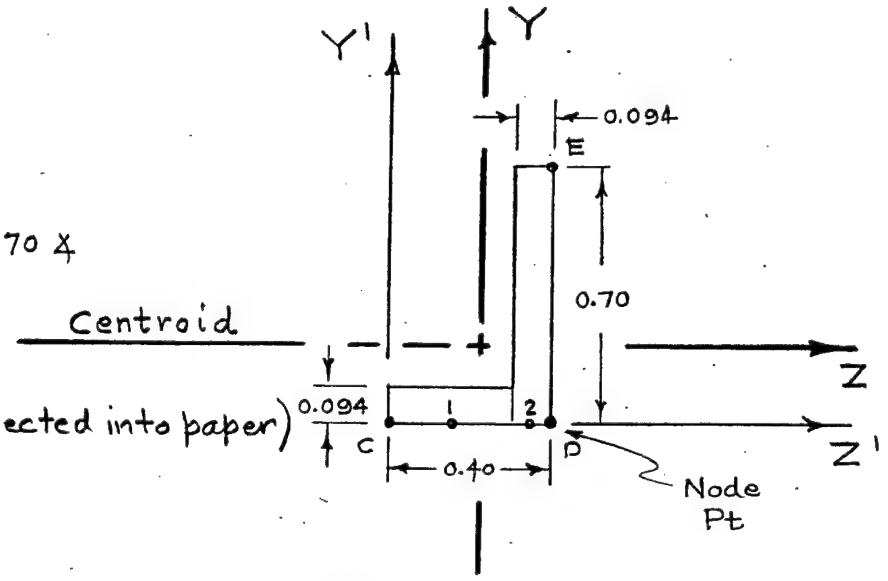
ELEMENT NUMBERS: CBAR 290 thru 292

DESCRIPTION:

(76) Angles in Right Side Panel

0.094 x 0.40 x 0.70 ℄

AL 2024-T3



C, D, E are NASTRAN Stress Output Points

CALCULATIONS:

The following information was input to the INERTIA program which calculated section properties for the above member.

Rectangle No.	Basic Dimensions B_i	H_i	Loc Pt Coordinates * Z'_i	Y'_i
1	0.306	0.094	0.153	0.0
2	0.094	0.70	0.353	0.0

*"Z" corresponds to "X" in the INERTIA program

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION- PID 113 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.30600	.09400	0.00000	0.00000	.15300	0.00000	0.00000
RECT	0.00	.09400	.70000	0.00000	0.00000	.35300	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.02876	.15300	.04700	.00002	.00022	0.00000	.00008
2	.06580	.35300	.35000	.00269	.00005	0.00000	.00019

```
*****
*****   TOTAL AREA=                  .946E-01
*****   X CENTROID DISTANCE=         .292E+00
*****   Y CENTROID DISTANCE=         .258E+00
*****   IX (ABOUT CENTROID)=         .455E-02
*****   IY (ABOUT CENTROID)=         .107E-02
*****   IXY (ABOUT CENTROID)=        .121E-02
*****   IMAX=                        .493E-02
*****   IMIN=                        .692E-03
*****   ALPHA=                      -.175E+02
*****   TORSIONAL CONSTANT, K=       .279E-03
*****   IX (ABOUT INPUT AXIS)=       .108E-01      Y= 0.
*****   IY (ABOUT INPUT AXIS)=       .915E-02      X= 0.
*****   IXY (ABOUT INPUT AXIS)=      .834E-02
*****
*****   TORSIONAL CONSTANT BASED ON SUM
*****         NOT NECESSARILY ACCURATE
```

PROPERTY NUMBER: 113 (continued)

Orientation of Beam Elements w.r.t. Basic Coordinate System is shown below for:

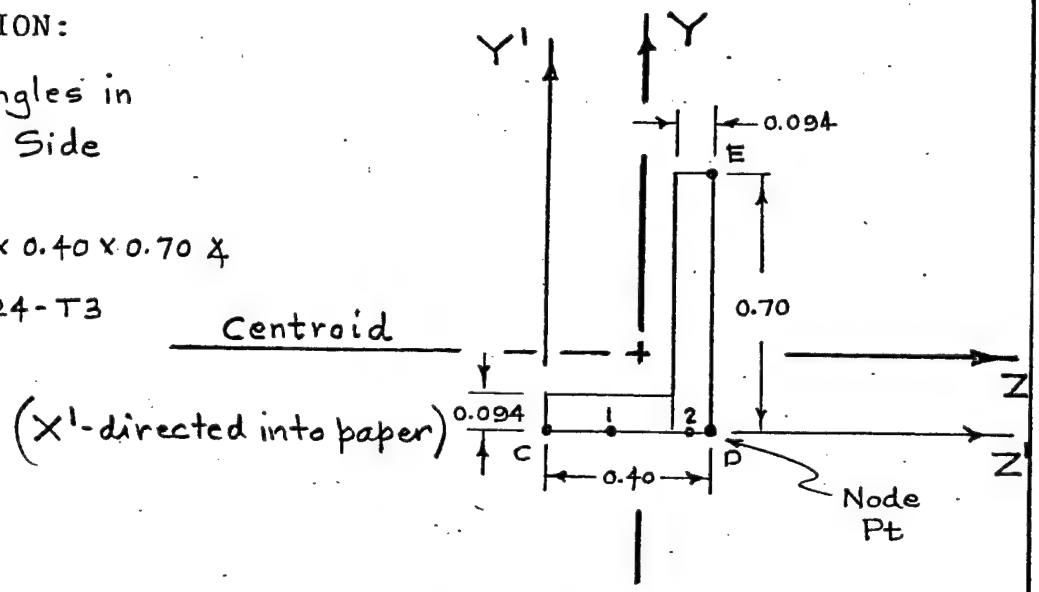
CBAR 290 thru 292

DESCRIPTION:

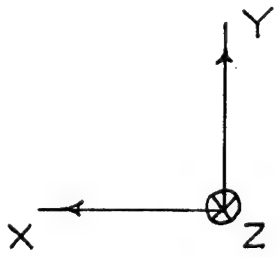
(76) Angles in Right Side Panel

0.094 x 0.40 x 0.70 ∠

AL 2024-T3



C, D, E are NASTRAN Stress Output Points



Basic Coordinate System

$\bar{v}$ components

$X_1 = 0.0$ $Y_1 = 1.0$ $Z_1 = 1.0$

Offsets will be:

$X_a = 0.108$ $X_b = 0.108$

$Y_a = 0.258$ $Y_b = 0.258$

$Z_a = 0.0$ $Z_b = 0.0$

PROPERTY NUMBER: PID 114

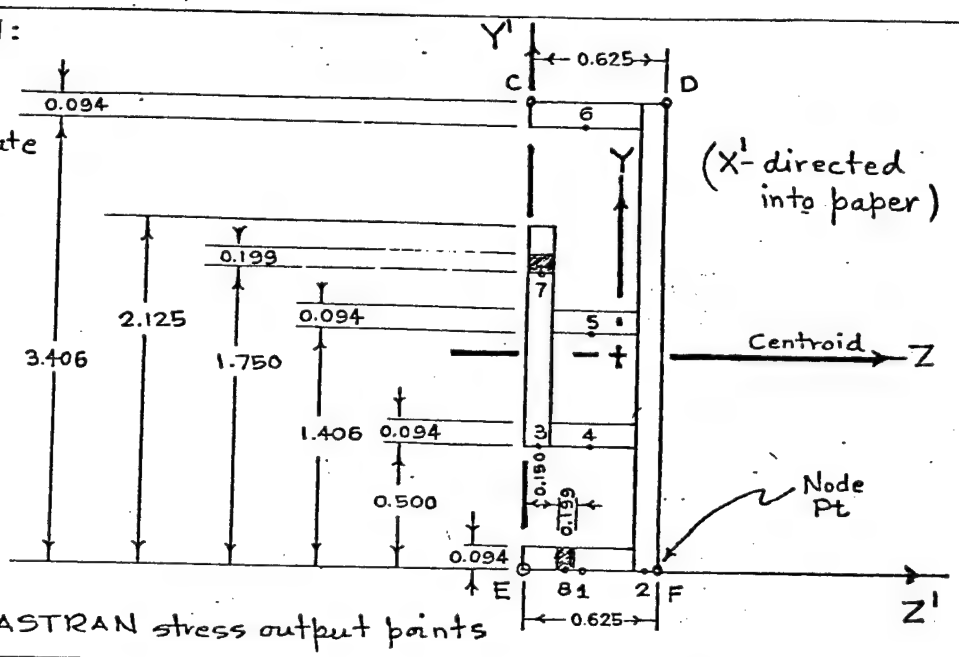
ELEMENT NUMBERS:

CBAR 215 thru 250

DESCRIPTION:

Vertical Posts (51) @ intermediate bays (back)

AL 6061-T6



C, D, E, F are NASTRAN stress output points

CALCULATIONS:

The following information will be input to the INERTIA program from which section properties will be calculated

Rectangle No.	Basic Dimensions B_i	H_i	Loc Pt Coordinates ** Z_i	Y_i
1	0.531	0.094	0.266	0.0
2	0.094	3.500	0.578	0.0
3	0.094	1.625	0.047	0.500
4	0.437	0.094	0.313	0.500
5	0.437	0.094	0.313	1.406
6	0.531	0.094	0.266	3.406
* 7	0.094	0.199	0.047	1.750
* 8	0.199	0.094	0.250	0.0

* Negative Areas

** "Z" corresponds to "X" in the INERTIA Program

INERTIA

BAR PROPERTY NUMBER

DESCRIPTION= PID 114 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.53100	.09400	0.00000	0.00000	.26600	0.00000	0.00000
RECT	0.00	.09400	3.50000	0.00000	0.00000	.57800	0.00000	0.00000
RECT	0.00	.09400	1.62500	0.00000	0.00000	.04700	.50000	0.00000
RECT	0.00	.43700	.09400	0.00000	0.00000	.31300	.50000	0.00000
RECT	0.00	.43700	.09400	0.00000	0.00000	.31300	1.40600	0.00000
RECT	0.00	.53100	.09400	0.00000	0.00000	.26600	3.40600	0.00000
RECT	-1.00	.09400	.19900	0.00000	0.00000	.04700	1.75000	0.00000
RECT	-1.00	.19900	.09400	0.00000	0.00000	.25000	0.00000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.04991	.26600	.04700	.00004	.00117	0.00000	.00015
2	.32900	.57800	1.75000	.33585	.00024	0.00000	.00097
3	.15275	.04700	1.31250	.03361	.00011	0.00000	.00045
4	.04108	.31300	.54700	.00003	.00065	0.00000	.00012
5	.04108	.31300	1.45300	.00003	.00065	0.00000	.00012
6	.04991	.26600	3.45300	.00004	.00117	0.00000	.00015
7	-.01871	.04700	1.84950	-.00006	-.00001	0.00000	-.00006
8	-.01871	.25000	.04700	-.00001	-.00006	0.00000	-.00006

```
*****
*****    TOTAL AREA=                 .626E+00
*****    X CENTROID DISTANCE=        .390E+00
*****    Y CENTROID DISTANCE=        .159E+01
*****    IX (ABOUT CENTROID)=        .681E+00
*****    IY (ABOUT CENTROID)=        .330E-01
*****    IXY (ABOUT CENTROID)=       .238E-01
*****    IMAX=                       .682E+00
*****    IMIN=                       .321E-01
*****    ALPHA=                     -.210E+01
*****    TORSIONAL CONSTANT, K=      .184E-02
*****    IX (ABOUT INPUT AXIS)=      .227E+01        Y= 0.
*****    IY (ABOUT INPUT AXIS)=      .128E+00        X= 0.
*****    IXY (ABOUT INPUT AXIS)=     .413E+00
*****
*****    TORSIONAL CONSTANT BASED ON SUM
*****          NOT NECESSARILY ACCURATE
```

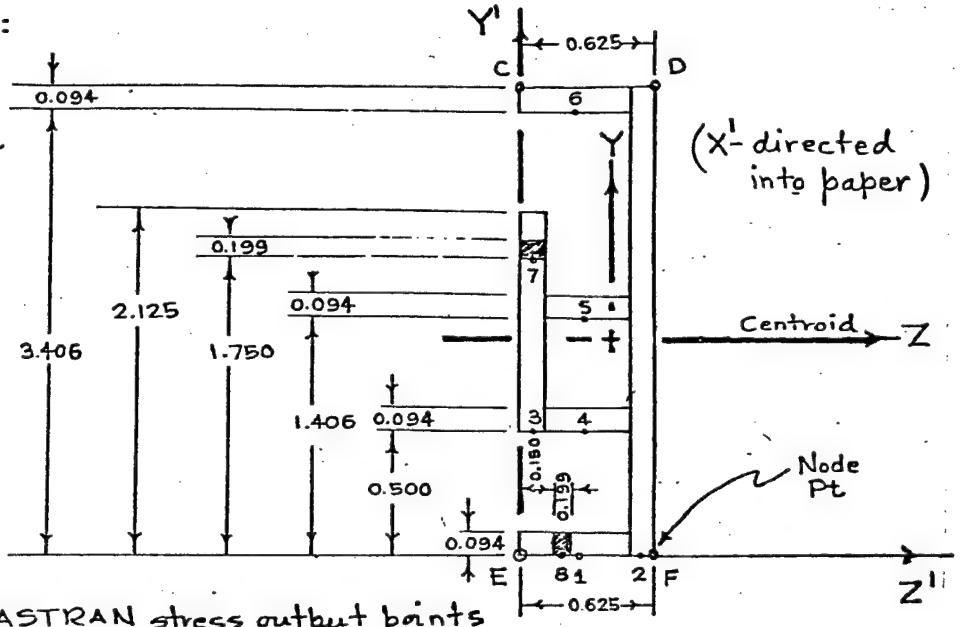
PROPERTY NUMBER: PID 114 (continued)

CBAR 215 thru 220

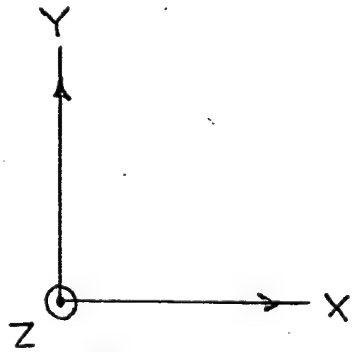
CBAR 227 thru 232

CBAR 239 thru 244

DESCRIPTION:
Vertical Posts (51) @ intermediate bays (back)



C, D, E, F are NASTRAN stress output points



Basic Coordinate Directions

Vector components for $\bar{v}$

$X_1 = 0.0$ $Y_1 = 1.0$ $Z_1 = -1.0$

Offsets will be:

$X_a = -0.235$ $X_b = -0.235$

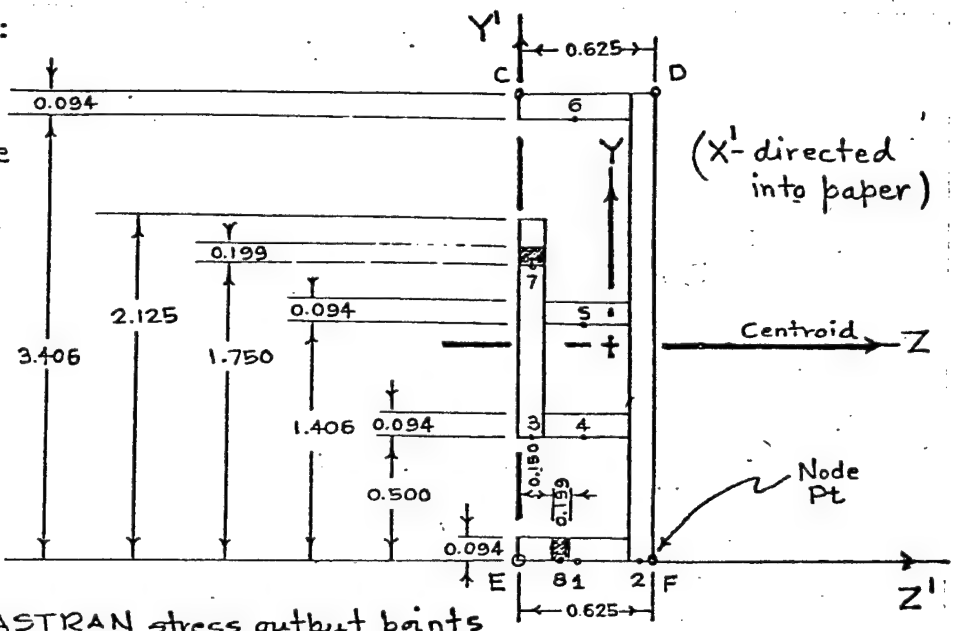
$Y_a = 1.59$ $Y_b = 1.59$

$Z_a = 0.0$ $Z_b = 0.0$

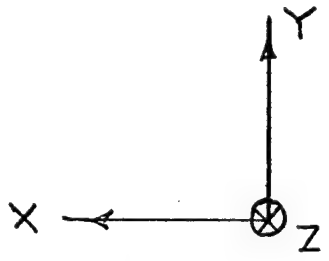
PROPERTY NUMBER: PID 114 (continued)

CBAR 221 thru 226
CBAR 233 thru 238
CBAR 245 thru 250

DESCRIPTION:
Vertical Posts (51) @ intermediate bays (back)



C, D, E, F are NASTRAN stress output points



Basic Coordinate Directions
Vector Components for $\bar{V}$

$X_1 = 0.0$ $Y_1 = 1.0$ $Z_1 = 1.0$

Offsets will be:

$X_a = 0.235$ $X_b = 0.235$

$Y_a = 1.59$ $Y_b = 1.59$

$Z_a = 0.0$ $Z_b = 0.0$

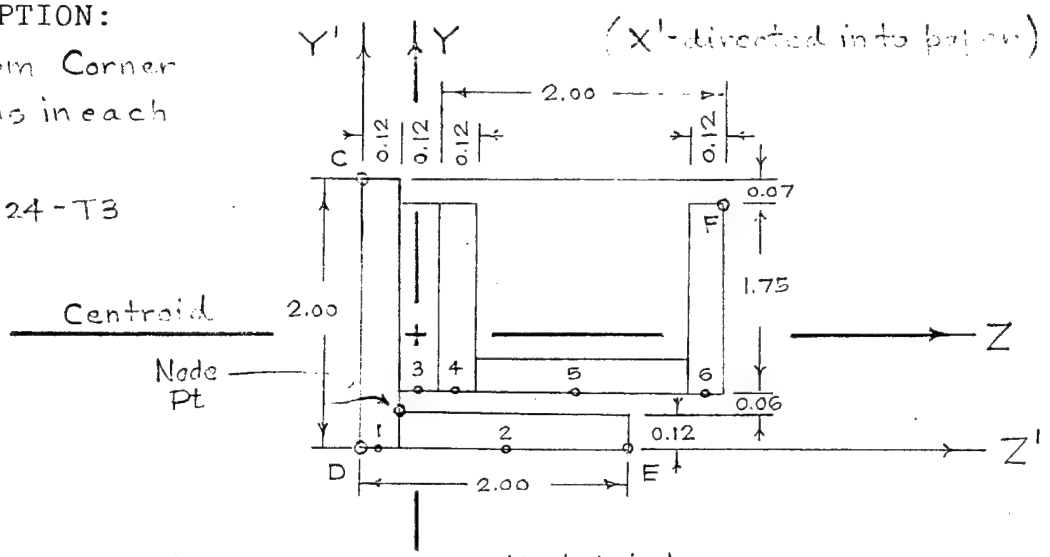
PROPERTY NUMBER: PID 115

ELEMENT NUMBERS: CBAR 252, 253, 257, 261, 265
CBAR 361, 365, 369, 373, 374

DESCRIPTION:

Bottom Corner Beams in each bay

AL 2024-T3



C, D, E, F are NASTRAN Stress Output points

CALCULATIONS:

The following information will be input to the INERTIA program from which section properties for the above member will be calculated

Rectangle No.	Basic Dimensions B_i	H_i	Loc Pt Coordinates * Z_i'	Y_i'
1	0.12	2.00	0.06	0.0
2	1.83	0.12	1.06	0.0
3	0.12	1.75	0.18	0.19
4	0.12	1.75	0.30	0.18
5	1.76	0.12	1.24	0.18
6	0.12	1.75	2.18	0.18

*"Z" corresponds to "X" in the INERTIA Program

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION= PID 115 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.12000	2.00000	0.00000	0.00000	.06000	0.00000	0.00000
RECT	0.00	1.88000	.12000	0.00000	0.00000	1.06000	0.00000	0.00000
RECT	0.00	.12000	1.75000	0.00000	0.00000	.18000	.18000	0.00000
RECT	0.00	.12000	1.75000	0.00000	0.00000	.30000	.18000	0.00000
RECT	0.00	1.76000	.12000	0.00000	0.00000	1.24000	.18000	0.00000
RECT	0.00	.12000	1.75000	0.00000	0.00000	2.18000	.18000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.24000	.06000	1.00000	.08000	.00029	0.00000	.00115
2	.22560	1.06000	.06000	.00027	.06645	0.00000	.00108
3	.21000	.18000	1.05500	.05359	.00025	0.00000	.00101
4	.21000	.30000	1.05500	.05359	.00025	0.00000	.00101
5	.21120	1.24000	.24000	.00025	.05452	0.00000	.00101
6	.21000	2.18000	1.05500	.05359	.00025	0.00000	.00101

```
TOTAL AREA=                    .151E+01
X CENTROID DISTANCE=           .822E+00
Y CENTROID DISTANCE=           .741E+00
IX (ABOUT CENTROID)=           .477E+00
IY (ABOUT CENTROID)=           .842E+00
IXY (ABOUT CENTROID)=         -.115E+00
IMAX=                          .876E+00
IMIN=                          .444E+00
ALPHA=                         .164E+03
TORSIONAL CONSTANT, K=         .627E-02
IX (ABOUT INPUT AXIS)=         .120E+01        Y= 0.
IY (ABOUT INPUT AXIS)=         .172E+01        X= 0.
IXY (ABOUT INPUT AXIS)=        .681E+00

TORSIONAL CONSTANT BASED ON SUM
        NOT NECESSARILY ACCURATE
```

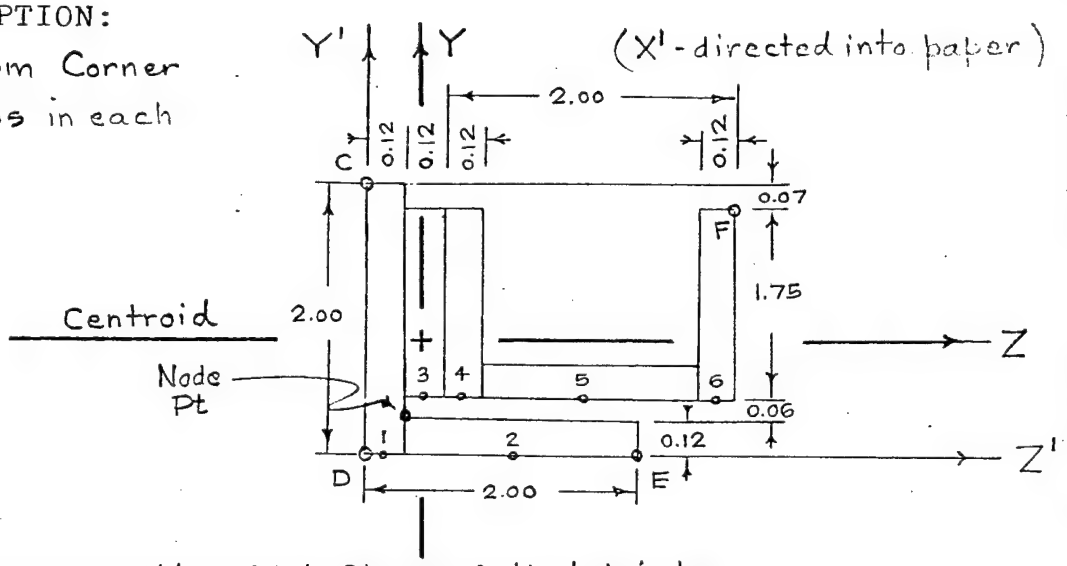
PROPERTY NUMBER: PID115 (continued)

Orientation of beam element w.r.t. Basic Coordinate System is shown below for

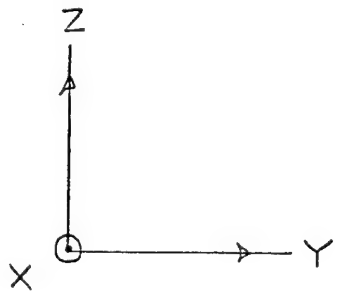
CBAR 252, 253, 257, 261, 265

DESCRIPTION:

Bottom Corner Beams in each bay



C, D, E, F are NASTRAN Stress Output points



Basic Coordinate Directions

Vector Components for $\bar{V}$

$X_1 = -1.0$ $Y_1 = 0.0$ $Z_1 = 1.0$

Offsets will be

$X_a = 0.0$ $X_b = 0.0$

$Y_a = 0.702$ $Y_b = 0.702$

$Z_a = 0.621$ $Z_b = 0.621$

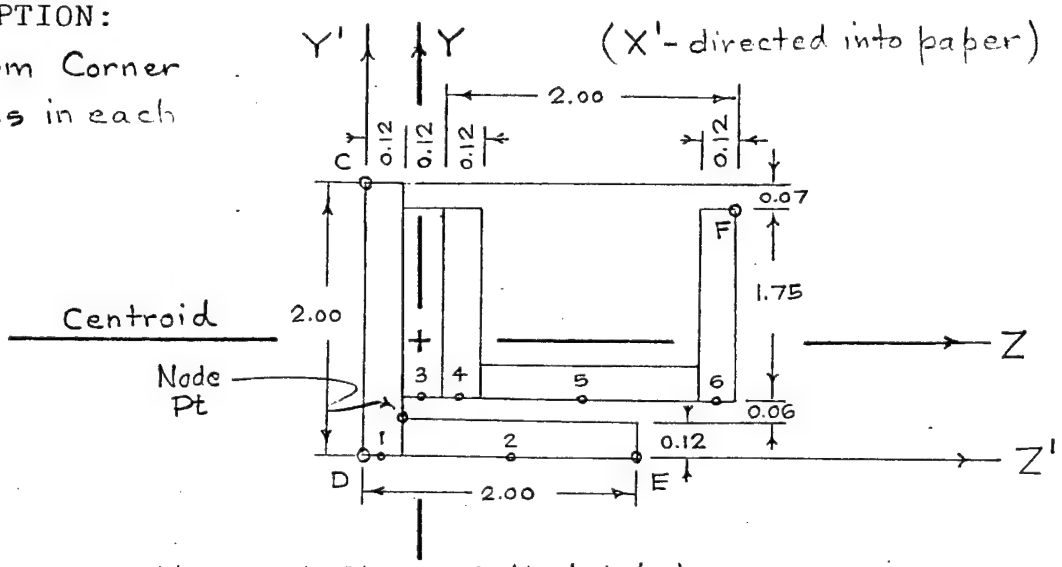
PROPERTY NUMBER: PID115 (continued)

Orientation of Beam Element w.r.t. Basic Coordinate System is shown below for:

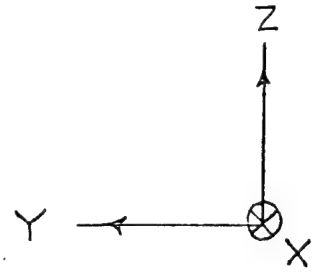
CBAR 361, 365, 369, 373, 374

DESCRIPTION:

Bottom Corner Beams in each bay



C, D, E, F are NASTRAN Stress Output points



Basic Coordinate Directions Vector Components for $\bar{v}$

$X_1 = 1.0$ $Y_1 = 0.0$ $Z_1 = 1.0$

Offsets will be:

$X_a = 0.0$ $X_b = 0.0$

$Y_a = -0.702$ $Y_b = -0.702$

$Z_a = 0.621$ $Z_b = 0.621$

PROPERTY NUMBER: PID 116

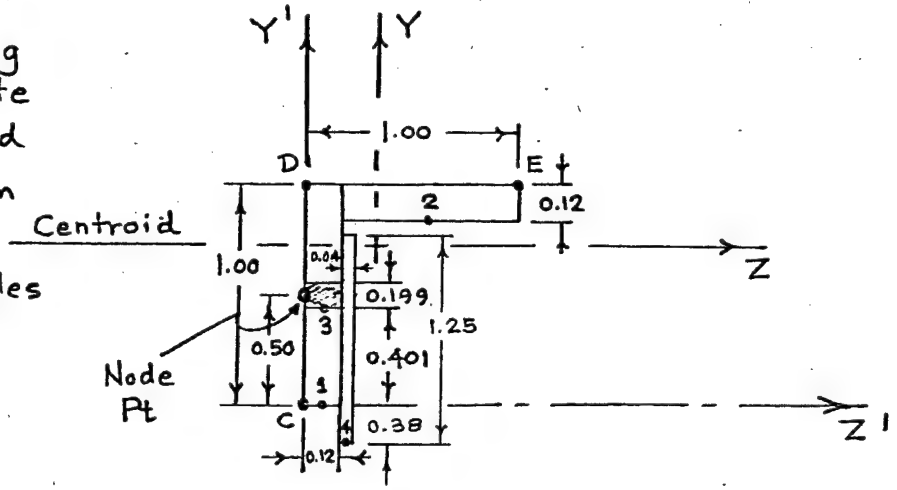
ELEMENT NUMBERS: CBAR 402, 403, 406, 407, 412, 414, 417, 419
422, 424, 427, 429, 432, 434, 486, 487

DESCRIPTION:

Diagonal Bracing for Intermediate Bays designated (7) and (11) on Dwgs

0.12×1.0×1.0 angles

AL 2024-T3



C, D, E are NASTRAN stress output points

CALCULATIONS:

The following information will be input to the INERTIA program which will calculate section properties for the above pictured member.

Rectangle No.	Loc Pt Coordinates **Z'_i	Y'_i	Basic Dimensions B_i	H_i
1	0.06	0.0	0.12	1.00
2	0.56	0.88	0.88	0.12
* 3	0.06	0.401	0.12	0.199
4	0.14	−0.38	0.04	1.25

* Negative Area

** "Z" corresponds to "X" in the INERTIA program

INERTIA

BAR PROPERTY NUMBER
DESCRIPTION= PID 116 RACK 75-0010

INPUT

TYPE	DUM	B	H	B1	H1	X	Y	ALF
RECT	0.00	.12000	1.00000	0.00000	0.00000	.06000	0.00000	0.00000
RECT	0.00	.88000	.12000	0.00000	0.00000	.56000	.88000	0.00000
RECT	-1.00	.12000	.19900	0.00000	0.00000	.06000	.40100	0.00000
RECT	0.00	.04000	1.25000	0.00000	0.00000	.14000	-.38000	0.00000

OUTPUT

NO.	AREA	XC	YC	IX	IY	IXY	K
1	.12000	.06000	.50000	.01000	.00014	0.00000	.00058
2	.10560	.56000	.94000	.00013	.00681	0.00000	.00051
3	-.02388	.06000	.50050	-.00008	-.00003	0.00000	-.00011
4	.05000	.14000	.24500	.00651	.00001	0.00000	.00003

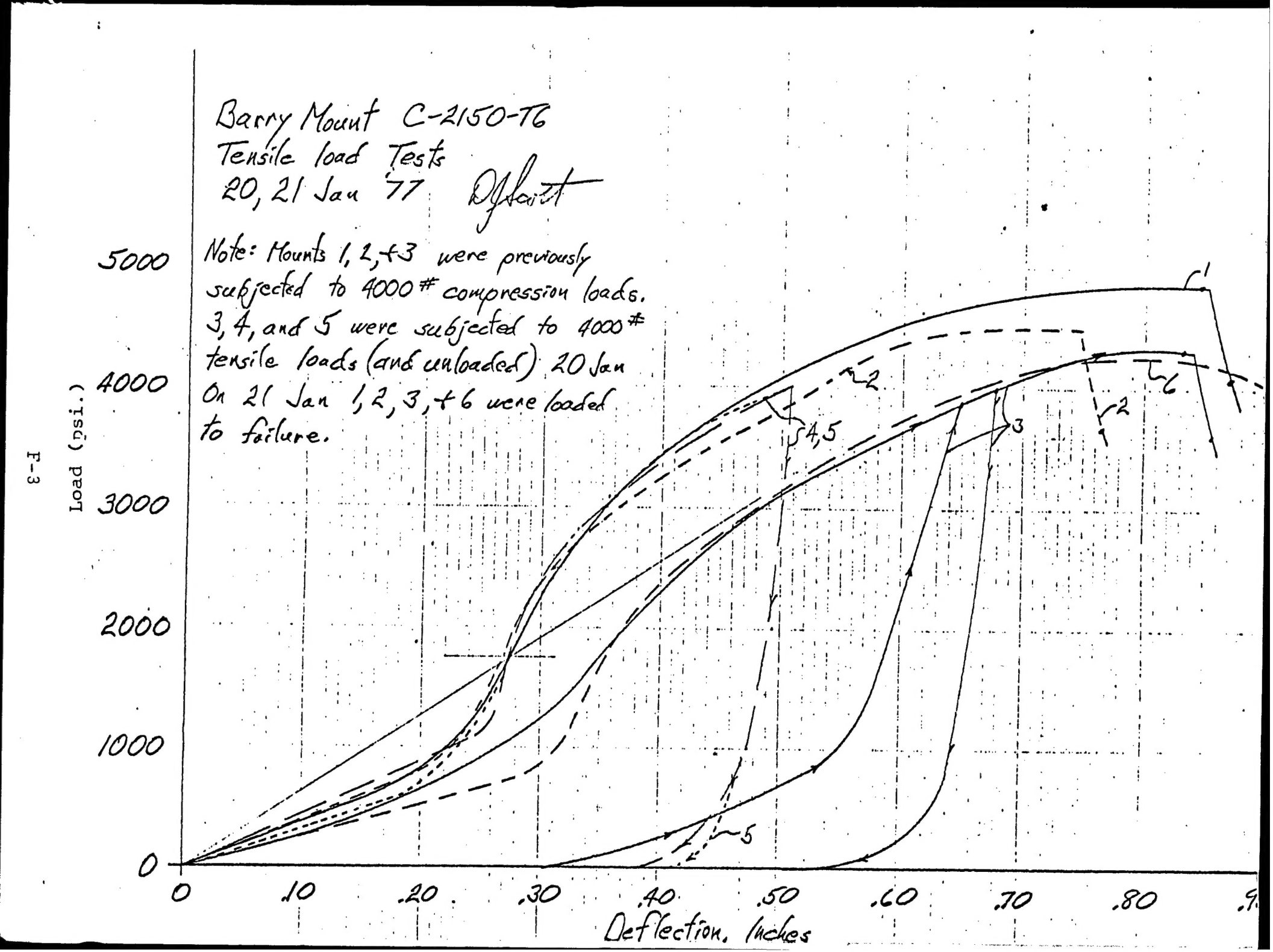
```
*****
*****    TOTAL AREA=                  .252E+00
*****    X CENTROID DISTANCE=         .286E+00
*****    Y CENTROID DISTANCE=         .634E+00
*****    IX (ABOUT CENTROID)=         .557E-01
*****    IY (ABOUT CENTROID)=         .208E-01
*****    IXY (ABOUT CENTROID)=        .146E-01
*****    IMAX=                        .447E-01
*****    IMIN=                        .119E-01
*****    ALPHA=                      -.315E+02
*****    TORSIONAL CONSTANT, K=       .995E-05
*****    IX (ABOUT INPUT AXIS)=       .157E+00        Y= 0.
*****    IY (ABOUT INPUT AXIS)=       .414E-01        X= 0.
*****    IXY (ABOUT INPUT AXIS)=      .602E-01
*****
*****    TORSIONAL CONSTANT BASED ON SUM
*****          NOT NECESSARILY ACCURATE
```

APPENDIX F

ELASTIC PROPERTIES AND ALLOWABLES FOR ISOLATORS

Presented in this appendix are the results of experimental tests in which the isolators were subjected to tensile loading in order to determine the spring constant and allowable load. The results are shown in the following figures. This information has been obtained from tests by Air Force personnel and is documented in Reference 4.

An examination of these curves reveals an allowable load of approximately 5,000 lb. in tension.


Barry Mount C-2150-T6
Tensile load Tests
20, 21 Jan '77
Note: Mounts 1, 2, +3 were previously subjected to 4000# compression loads. 3, 4, and 5 were subjected to 4000# tensile loads (and unloaded) 20 Jan On 21 Jan 1, 2, 3, +6 were loaded to failure.
Load (psi.)
5000
4000
3000
2000
1000
0
0
.10
.20
.30
.40
.50
.60
.70
.80
Deflection, Inches
1
2
4,5
3
2
6
5